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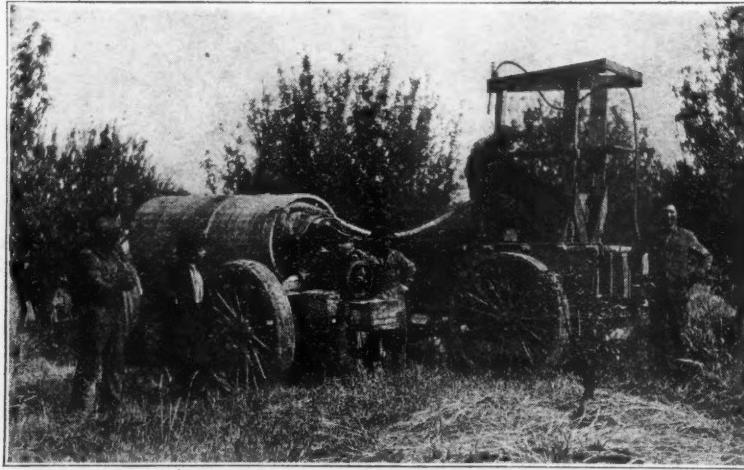
No. 2

FEBRUARY, 1924

Some Notes on Spray Machinery

by O. G. Anderson

Purdue University

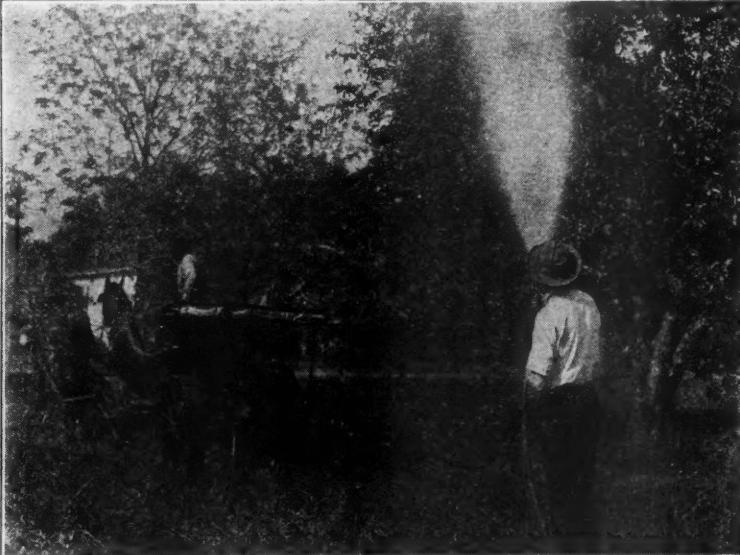


A 400-gallon water conveyor which fills a 300-gallon spray outfit in three minutes. Both machines are equipped with extra wide sectional rims for soft ground. Some sort of tower is indispensable for trees more than 22 feet tall. The sprayer is a 15 horsepower, 20-gallon-a-minute machine, which supplies three guns handily.

commonly sold. In 1914 the largest outfit cost about \$350; today a 20-gallon machine averages about \$1000. The difference in price is due not only to higher wages and general overhead, but to larger engines and pumps built of materials greatly su-

The Outfit to Buy.

"Which one of these outfits shall I buy?" is a question often raised by the grower. The answer depends on the size of the orchard and the kind of nozzle used. Most commercial growers are able to maintain a daily



There is fog and life in the spray coming from this gun. This 3½ horsepower machine carries one gun nicely, but with two guns the spray is coarse and spattering, the outfit is overloaded and its period of usefulness shortened.

perior in strength and yet much lighter in proportion to the power developed. And a considerable part of the manufacturing expense comes from the factory equipment necessary to produce the numerous models now on the market.

output of six to eight tanks of spray mixture. The limit of satisfactory performance for an outfit will then be measured by the critical spray of the season. For instance, the apple grower in a humid region may find that to control scab effectively, he

must have an outfit large enough to cover his orchard in five or six working days. In another region the apple grower finds the blossom spray is the critical time. His varieties may allow him two weeks to spray, but in that time there are two Sundays, and he must allow for rainy weather and breakdown.

How the Spray Gun Affects the Size of Outfit Purchased.

After the necessary capacity of the outfit has been figured, the nozzle may still have to be considered. Any nozzle of small capacity like the standard disk type can be used on any power outfit, and even on the barrel pump. But a grower who attempts to use a gun should have at least six gallons of spray mixture per minute to operate it properly. In daily performance, therefore, a gun should be used only on outfits of three horsepower or above in capacity. Many growers may not at first agree with this statement, and may refer to the many smaller outfits on which guns are now used. But there seems to be plenty of evidence to prove the point. We cannot quote at length, but LeRoy Childs, Superintendent of Hood River Experiment Station, Oregon, writing for the February, 1923, issue of this magazine states, "With the appearance of the spray gun has come much ineffective spraying. Not because the spray gun is a failure, but because growers have tried to use it on all types of sprayers. . . . At Hood River we find that the gun operated on a 1½ horsepower outfit has given poor results." He also found that operating two guns on a 3½ horsepower outfit was unsatisfactory, and similar conclusions have been reached from tests made at Purdue University. The guns thus operated deliver a coarse, spattering spray, the tops of large trees are not properly covered, and the overload on the outfit shortens its period of usefulness.

To sum up the requirements for proper operation of a gun, we should have:

First—An outfit delivering at least six gallons per minute for each gun used.

Second—Three hundred pounds pressure on most outfits, with 250 pounds a safer pressure on the smaller as well as older outfits.

Third—Disk openings in the guns should be one-eighth inch to nine sixty-fourths inch in size, delivering from five and three-fourths to six and one-half gallons per minute when fully open.

Only when these requirements are met can we expect a finely divided spray and thorough covering of all portions of the tree.

Does Your Machine Operate Efficiently?

Bearing in mind that each gun used should have a pump capacity of six gallons behind it, Fruit Grower Brown figures that his four horse-power twelve-gallon machine will carry two guns. The salesman told him it would, and it may, until pump packings and gun disks get worn a hundredth part of an inch, or the engine idles down. It is not generally known

(Continued on page 12.)

Spraying the Georgia Peach Crop

by Oliver I. Snapp and John C. Dunegan

U. S. Bureau of Entomology

U. S. Bureau of Plant Industry

FIGHTING the insects and diseases that attack the peach fruit has been the most important problem confronting the Georgia peach grower since 1920, when the crop was damaged to the extent of several million dollars by the peach curculio. Recent life history studies of the curculio have revealed the fact that frequently two generations of the insect occur annually in Georgia, as was perhaps the case during the disastrous 1920 season, and that usually a large percentage of the "worms" in the peaches at harvest time in Georgia are "worms" or larvae of the second brood. These new scientific truths called for a revision of the spray schedule which had been used in Georgia for a number of years prior to 1921. When the new spray schedule was formulated in 1921, control measures were directed against two broods of the curculio. This new schedule has given excellent results during the last three years, and with supplementary control measures has reduced Georgia's curculio infestation to normal again.

First Spray Is Applied When Petals Fall.

A very important discovery in the feeding habits of the curculio was made several years ago in the south when it was found that the beetles

ment materially reduces the curculio infestation in the peach "drops."

The second spray is applied to

peaches in Georgia when the calyces are shedding, or when the small peaches are exposed, which is usually

about 10 days after the petals fall. The old schedules called for the first spray to be applied at this time. The same materials are used for this second spray as for the first, as mentioned above.

Spraying for Brown Rot.

Two weeks after the second application or between three and four weeks after the petals have been shed, the third spray is applied to Georgia peaches. This is primarily for the control of scab, but is also the first brown rot spray, and self-boiled lime-sulphur (8-8-50) is used alone. The sulphur-lime-calcium caseinate or dry mix substitute for self-boiled lime-sulphur has been used to some extent for brown rot control, but more or less burning of the foliage has resulted under Georgia weather conditions from the use of dry mix formulae which have worked satisfactorily in other states. Experimental tests with different dry mix formulae are being continued in Georgia with the hope of eventually finding one which can be used with safety under weather conditions there, as the advantages of the new spray are realized if it is as effective as the self-boiled material and if it can be used without injury to the foliage or fruit.

No lead arsenate is used in the third spray unless the curculio infesta-

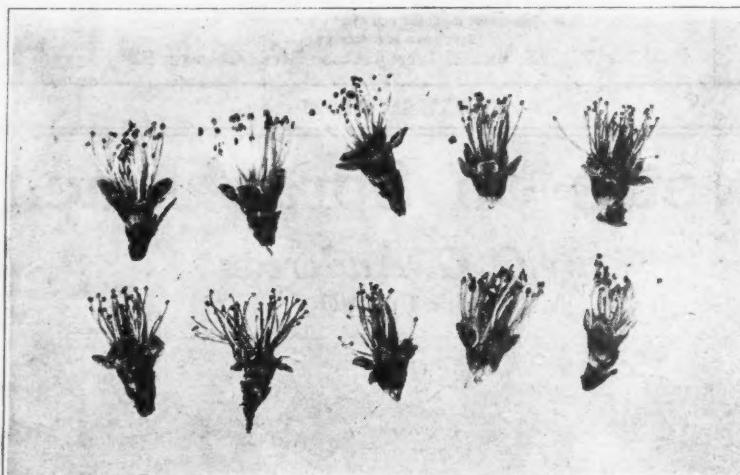


Fig. 1—Peach flowers showing curculio feeding marks in calyces.

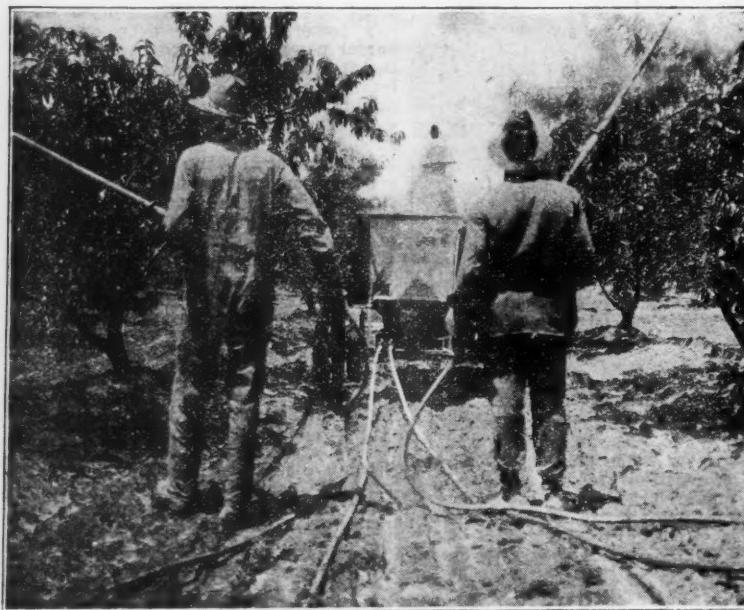


Fig. 2—Spraying with arsenate of lead when 75 per cent of the petals are down for the control of the curculio as they appear from hibernation.



Fig. 3—Some growers prefer the dust spray to the liquid spray for the control of peach pests.

fed to a considerable extent on the calyces of the peach flower while they are green and succulent (Fig. 1). The curculio starts to appear from hibernation in numbers by the time the peach trees are in full bloom. Before the curculio can get to the small peach fruit, which at that time is enveloped in the flower, they take a good meal or two from the calyces, which are then green and apparently palatable to the insects. It was found that by poisoning the calyces with an application of arsenate of lead when about 75 per cent of the petals had dropped, a number of the adult curculios were killed off while the little peach was still enveloped in the calyx and before the insects could get to it to deposit eggs (Fig. 2). It was also found that the curculio always feeds considerably before depositing any eggs, and this early feeding in the spring takes place to a large extent on the calyces of the peach flower. Georgia peach growers now apply the first curculio spray when 75 per cent of the petals (pink) are down and use the powdered arsenate of lead in the proportion of four pounds to the 200 gallons of water with milk of lime from 12 pounds of unslaked lump lime. This early lead arsenate treat-

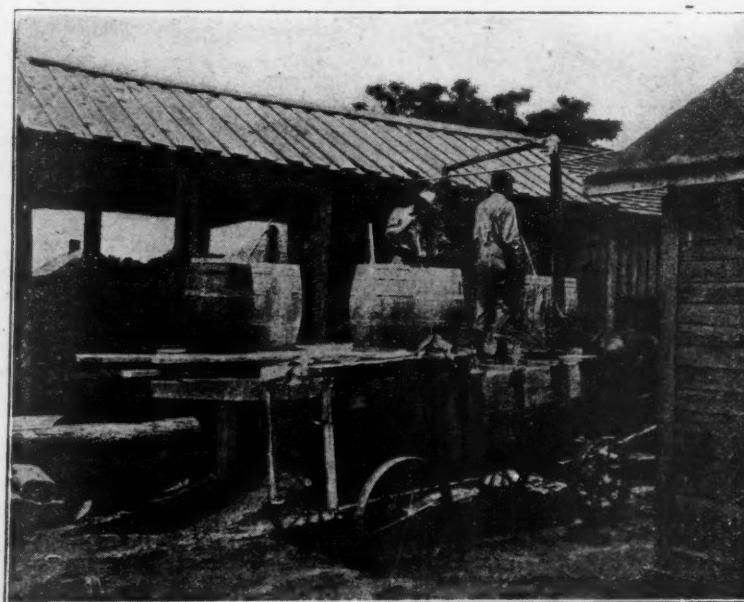


Fig. 4—A convenient arrangement for making the self-boiled lime-sulphur.

tion was particularly heavy the year before, or unless there is reason to suspect that it will be heavy during the current season. Peach trees in Georgia will not stand more than three lead arsenate applications as an annual treatment. These are applied in the first, second and fourth sprays. Under abnormal curculio conditions, lead arsenate is also used in the third application; however, this is done only in case of an emergency, as four applications of arsenate of lead per season result in rather severe burning of the foliage.

Spraying for the Second Brood of "Worms."

The Georgia peach grower believes the fourth and last spray is the most important of all, and he is right because it is for the second brood of "worms," which is usually responsible for most of the wormy peaches at harvest time. The second brood makes its appearance in Georgia with the ripening of the Hiley and continues to appear throughout the Georgia Belle and Elberta ripening season. Varieties ripening before the Hiley escape damage from the second brood, and consequently the fourth spray is often

(Continued on page 18.)

Orchard Spray Program for the Pacific Northwest

By A. L. Lovett, Entomologist and H. P. Barss, Plant Pathologist
Oregon Agricultural Experiment Station

On account of the climatic differences existing between the more humid orchard sections west of the Cascade Mountains and the semi-arid or arid and irrigated regions east of this range, the conditions as to pests and diseases are different and require a somewhat different spray program. In general there are a greater number of diseases and pests to be sprayed for in western Oregon, Washington and British Columbia than in the drier orchard sections of the interior. Hence the full spray program for the section west of Cascades will be presented and then followed by paragraphs outlining the program for other sections.

SPRAY PROGRAM I

For humid sections of Washington, Oregon and British Columbia west of Cascades

APPLES AND PEARS.

Time of Application.	Pest or Disease.	Spray Material and Strength.
(1) Dormant spray. As winter buds swell just before opening.	San Jose Scale, Blister mite and Spider mites. (Footnote 6.)	Lime-sulphur 12 to 100 or miscible oil 8 to 100.
	Apple leaf roller. (Footnote 5.)	Dormoll 8 or 10 to 100.
	Scab and powdery mildew.	Lime-sulphur 3½ to 100.
	Aphids on apple. (See Footnote 1.)	Add nicotine sulphate ½ lb. to 100 gal. of spray.
	Scab and Mildew.	Lime-sulphur 2½ to 100.
	Fruit worms on pear and bud moth.	Add lead arsenate 3 lbs. to 100 gal. of spray.
	Scab and Mildew.	Lime-sulphur 2½ to 100. (Footnote 2.)
	Coddling moth on apple.	Lead arsenate 2 lbs. to 100 gal.
	Fruit worms on pear (if pink spray was not applied).	Lead arsenate 2 lbs. to 100 gal.
	Scab and Mildew.	Lime-sulphur 2 to 100.
	Pear slug	Lead arsenate 2 lbs. to 100 gal.
	Coddling moth. (Footnote 3.)	Lead arsenate 2 lbs. to 100 gal.
	Scab and Mildew.	Lime-sulphur 2 to 100.
	Coddling moth, second generation.	Lead arsenate 2 lbs. to 100 gal.
	Anthracnose canker.	
	Coddling moth. (May usually be omitted on pear.)	(See Footnote 4.)
		Same as for No. 7.

Footnote 1. Where aphids are very bad, especially with varieties somewhat resistant to scab, omit nicotine from Spray No. 2, adding it to Spray No. 3, which should then be applied just as soon as the blossom buds separate from each other.

Footnote 2. Ordinary lime-sulphur is liable to russet the skin of some varieties of pears like d'Anjou, Comice and Howell, and may cause burning of apples when hot weather comes on. Under such circumstances substitute self-boiled lime-sulphur 8-8-50 or a reliable wettable sulphur or Atomic Sulphur 12 lbs. to 100 gal.

Footnote 3. Coddling Moth control is such a complex problem and of such outstanding importance, that too much dependence should not be placed upon a general spray program of this nature. Supplement the suggested program with all the trained assistance and advice obtainable. An additional cover spray two weeks after the 30-day spray is advisable where worm control has been poor. This extra spray seems especially advisable on varieties which grow rapidly, as the King, to afford protection for the rapidly expanding surface. The late cover spray may usually be omitted on pear. Supplement the spraying by the earliest collection of fallen fruit at thinning time if pays. Scrape the scaly bark from the trees during February and March, band the trees in June and destroy the accumulated worms over two weeks. Increasing the dosage of lead in the late cover spray to 3 or 4 lbs. to 100 gal. is a fairly common practice and, for bad worm infestations, is advisable. Coddling moth is not a commercial orchard pest of British Columbia and no program of control is required.

Footnote 4. Anthracnose or black spot canker and fruit rot may be successfully prevented by a single thorough summer application of Bordeaux mixture 4-4-50. For the sake of economy this may be put in with the July or August worm spray. A fine misty spray should be used and if casein spreader is added it should be dissolved first in water before going into the tank. Commercial ready-mixed Bordeaux materials are inferior to the properly home-made spray.

Footnote 5. Leaf Rollers occur as a major pest only in certain of our fruit sections. Oil emulsion in the early pre-pink (delayed dormant) is the standard spray. Dormoll has given uniformly better results in leaf roller control than other western oils. Some miscible oils are apparently of little value in control. Where conditions develop that prevent maximum effectiveness from the oil spray and for very light infestations of leaf-roller, use double strength lead arsenate (4-100) in the pink spray.

Footnote 6. Blister Mite on pear is controlled with a fair degree of certainty by the dormant lime-sulphur in the spring; in fact, if especial attention is given to thoroughness, an application of dormant lime-sulphur one year in three will control blister mite on pear. Equally favorable results on apple are by no means the rule. Failures, where thoroughness has been observed, are usually due to delaying the application too late. So frequently are poor results secured by spring applications on apple that where blister mite is serious, fall sprays are advised. Use 8 to 12 gal. lime-sulphur for every 100 gal. of water, any time in the fall after the majority of the leaves fall, up until early December.

PRUNES AND PLUMS

(1) Dormant spray. As winter buds are ready to open.	San Jose Scale, spider mite, twig miner.	Lime-sulphur 12 to 100. If scale is absent dilute 8 to 100.
(2) Pre-blossom spray. Buds white just before opening.	Brown rot (Monilia) Blossom blight.	Bordeaux 4-4-50 with spreader or lime-sulphur 3 to 100.
	Bud moth.	Lead arsenate 2 lbs., lime 2 lbs. to 100 gal.
	Aphids.	Nicotine sulphate ½ lb. to 100 gal.
	Cylindrosporium leaf spot and brown rot.	Self-boiled lime-sulphur 8-8-50 with spreader or Atomic sulphur 12 lbs. to 100 gal.
	Syneta beetle.	Lead arsenate 2 lbs., lime 2 lbs. to 100 gal.
(4) and (5) About June 1 and July 1.	Cylindrosporium or brown rot if troublesome.	As under (3).
(6) August spray. About a month before harvest.	Brown rot.	As under (3).

PEACHES

Time of Application.	Pest or Disease.	Spray Material and Strength.
(1) Leaf Curl spray. From December to mid-February.	Peach Leaf Curl.	Bordeaux mixture 6-6-50.
(2) Late dormant spray. Just as first buds are ready to open.	Peach twig miner, San Jose scale, spider mite.	Lime-sulphur 12 to 100. If scale is absent, dilute 8 to 100.
	Bud moth.	Lead arsenate 2 lbs., lime 2 lbs. to 100 gal.
(3) First fruit spray. As soon as shucks fall.	Peach blight (fruit spot), mildew or brown rot.	Self-boiled lime-sulphur 8-8-50 with spreader or Atomic Sulphur 12 lbs. to 100 gal. If bad repeat once or twice at 2 or 3 week intervals.
(4) Late summer spray. About 6 weeks before harvest.	Brown rot.	Same as No. 3 or use dusting sulphur when air is still.
(5) Early fall spray. As soon as each variety is picked.	Peach blight and die back.	Bordeaux 4-4-50.

CHERRIES

For San Jose Scale—Same as No. 1 on prune program.
For Aphids—Use nicotine sulphate, 1 lb. to 100 gal. with pre-blossom spray (same as No. 2 for prune). Use tanglefoot bands on trees to prevent reinfestation of aphids by ants.
For Cherry Fruit Maggot—Use sweetened poison spray for adult flies. Use: Lead arsenate, ½ lb.; syrup, 2 qt.; water, 8 gal. Apply about 1 qt. to the tree, spraying the upper surface of the outer leaves only; when adult flies appear. This will be from June 8 to 20. Repeat application 10 days later and give a third spray one week after second.
For Brown Rot (Monilia) Blossom Blight—Same as No. 2 on prune program.
For Cylindrosporium Leaf Spot—(Yellow Leaf). Same as Nos. 3, 4, 5, on prune program.
For Brown Rot on Fruit—Use self-boiled lime-sulphur 8-8-50 with spreader, or Atomic Sulphur 12 lbs. to 100 gal. or a reliable wettable sulphur, one month before picking. Begin earlier if disease shows up sooner and repeat every 3 weeks till a month before picking.

APRICOTS

For Brown Rot (Monilia) Blossom Blight—Same as No. 2 on prune program. Prune out and destroy all dead twigs and spurs in winter.
For Fruit Spot—(Peach Blight fungus). Same as Nos. 3 and 5 on peach program. San Jose Scale and other insects same control as for similar insects on peach.

SPRAY PROGRAM II

For semi-arid sections of the Northwest east of Cascade Range and for Rogue River Valley in Oregon.

APPLES AND PEARS

Scab—Present and troublesome only in a few localities. Where sufficiently abundant to justify spraying, apply Nos. 3 and 4 in Program I for apples and pears.
Powdery Mildew—Use applications Nos. 2, 3, 4 and 5 in Program I for apples. Continue if necessary. Observe Footnote 2. Use casein spreader first dissolved in water. Supplement by winter and summer pruning out. Pink spray most important to avoid sulphur shock.

Coddling Moth—(Except for British Columbia.) Following the calyx application the first cover spray (30 day) is applied just before first worms hatch. In general this will be earlier for interior (15 days) than for coast area. Follow with: second cover spray 2 weeks after first cover spray; third cover spray 4 weeks later, and fourth cover spray 4 weeks after third.

For southern Oregon an additional late cover spray may be necessary. Double strength lead in late spray advisable. Calyx spray on pears likewise advisable in southern Oregon.

For eastern Washington, northern Idaho, the Grande Ronde Valley of Oregon, follow Program I. although in higher altitudes probably two cover sprays will generally suffice.

Citrus Red Spider—Use spray No. 1 in program I, and see Footnote 6.

Blisters Mite—Use spray No. 1 in Program I. For apple see Footnote 6.

Leaf Rollers, Fruit Worms, San Jose Scale, Aphids—Follow Program I for these insects.

PEACHES

Leaf Curl, Mildew and California Blight, Twig Miner, San Jose Scale, Spider Mite—Follow Program I for these diseases and insects.

CHERRIES

Practically no fungous diseases requiring spray. Insects in general would require no regular program of sprays. For specific pests follow Program I for cherry.

APRICOTS

California Blight—Follow Program I for peach blight. Insect pests and treatment same as for peach in Program I.

PRUNES AND PLUMS

No fungous diseases requiring spray as a rule. San Jose Scale, Twig Miner and Spider Mite are principal insect pests. Where present control with spray No. 1 in Program I for prunes and plums.

SPRAY POINTERS

The proportions of lime-sulphur recommended for sprays in this bulletin are based on the use of the standard concentrated liquid lime-sulphur testing about 32 degrees by Baume hydrometer test. Thus where the recommendation "lime-sulphur 12 to 100" appears in the calendar, it means that 12 gal. of the concentrated liquid lime-sulphur should be used in every 100 gal. of spray to make the proper dilution.

Where the powdered or "dry lime-sulphur" is used, it will take about 4 lbs. of the dry powder to equal 1 gal. of the standard concentrated liquid lime-sulphur in active ingredients. For example, where this bulletin recommends "lime-sulphur 12 to 100," the grower employing the dry form should use 48 lbs. of the dry lime-sulphur with every 100 gal. of water to get the same strength of spray.

The powdered form of lead arsenate is the basis of the formulas for this poison recommended in this bulletin. When arsenate in paste form is used the grower should employ double the number of pounds indicated in the bulletin.

Bordeaux Mixture is most satisfactory when freshly made according to standard methods. The "ready-mixed" type of commercial Bordeaux is in general decidedly inferior to good home-made spray. The types of commercial Bordeaux powders, in which the powdered bluestone and hydrated lime are sold in separate packages and added separately to the spray tank, appear to be better than the materials combined by the manufacturer. The hydrated lime must not have become air-slaked (carbonated) when used and directions must be followed carefully or poor results will be obtained.

Home-made Bordeaux must be used the same day it is made or else ordinary cane sugar must be added at the rate of 1 oz. (1 heaped tablespoon) for every 8 lbs. of stone lime or 10 lbs. of hydrated lime employed. The sugar should be dissolved before adding to the tank of Bordeaux. It prevents the spray from crystallizing and deteriorating.

Spreader—Materials used with a fungicide or insecticide spray to increase the spreading and adhesive powers are rapidly coming to the front. Calcium caseinate is excellent for use with lead arsenate alone. Where added in powder form to sprays containing Bordeaux, lime-sulphur or other fungicide it sometimes gums things up badly. In such cases it is suggested that the spreader be completely dissolved in water before adding to the spray tank.

Dusting—Experimental work in the Northwest in general has not been very encouraging to the substitution of dusting for spraying especially in those sections subject to severe attacks of fungous diseases under relatively cool climatic conditions, but improved materials, machinery and application methods now under test may show dusting to be worth while in controlling certain special pests.

Spray Combinations—Any of the materials mentioned in this spray program in connection with any particular application may be successfully combined, but it is best not to add lead arsenate to a tank of diluted lime-sulphur until the last thing before starting to spray.

Sulphur Shock—Under certain climatic conditions if lime-sulphur has not been used on apple trees in the earlier pre-pink or pink applications a very severe injury with foliage and fruit drop may result when lime-sulphur is applied later after blooming. This is known as sulphur shock and occurs without regard to strength of spray. Immunity against this danger can be secured only by application of the pre-blossom sprays as scheduled.

Cherry Diseases and Their Control

by W. C. Dutton

Michigan Agricultural College

THE PRODUCTION of sour cherries has become one of the most important branches of the fruit-growing business in several states in the region of the Great Lakes. The heaviest production is in Michigan, Wisconsin, New York and Northern Ohio, and all these districts have climatic conditions which are frequently favorable to the development of many fungous diseases, and it is fortunate, perhaps, that this is true, as many slipshod and careless growers are automatically eliminated sooner or later because of their failure to control certain enemies of the cherry tree. Most of the diseases of the cherry can be controlled if proper methods are employed, and it may be said then that they are really "blessings in disguise" for the grower who cares for his orchard in the proper way.

There are several diseases affecting the cherry which are neither common nor serious and they will not be discussed here. There are, however, several diseases which are frequently serious and deserve attention. The most important are leaf-spot, brown-rot, root-rot and gummosis, but this discussion will be limited to leaf-spot and brown-rot.

Brown-rot

Brown-rot is usually not serious with sour cherries, but in some seasons may cause rather heavy losses. In Michigan, in 1922, weather conditions were favorable for its development, and the disease developed in some districts to an alarming extent, so that carlot shipments decayed badly in transit and many lots were rejected at the canning factories. Sweet cherries are generally more susceptible than the sour varieties and heavy losses with them frequently occur just as the fruit is ripening. The susceptibility of the fruit to brown-rot increases as the fruit matures so that the resistance is least just at the most critical time. The brown-rot fungus is carried over the winter in the "mummies," which either hang on the tree or drop to the ground. "Mummies" are the dried and shriveled cherries that were affected by brown-rot the previous year, or earlier. The spores which spread the disease are first discharged about the time the blossoms open and injury to the blossoms is frequently serious, although the greatest injury is to the fruit. It is fortunate for the grower that thorough treatment with the proper materials will usually control brown-rot. Definite recommendations for control measures will be given later.

Cherry Leaf-Spot.

Leaf-spot is one of the most serious of the diseases attacking the sour cherry; the sweet cherries are usually

ly not quite so susceptible. There is much difference in susceptibility of different varieties. English Morello is extremely susceptible and this is one of the reasons why this variety

leaf or shot-hole fungus. The name used frequently varies with the way in which the fungus develops on the leaves. The fruit and fruit stems may be affected but the trouble is

the blossoms have dropped, and the first evidence of leaf-spot usually is apparent not earlier than the last of May or early in June. This statement applies to the northern states. Its appearance farther south would occur somewhat earlier. Spores of another type are then produced on these new leaves, which carry the disease to the leaves that develop later. Diseased leaves usually fall to the ground. This process may be repeated several times during the summer if weather conditions are favorable, or it may go on almost continuously if rains are frequent.

Weather Conditions and Leaf-Spot.

Leaf-spot does not, in most districts, develop in really epidemic form every year. It will usually be found every year to a certain extent, but may not cause any injury to the trees in many seasons. The seriousness of this disease depends almost entirely on the amount and distribution of rainfall, particularly during the early part of the growing season. The fungus simply cannot develop and spread without a liberal supply of moisture. In the first place the old leaves must be thoroughly wet for some time before the spores can be discharged and the leaves upon which they fall must remain moist for several hours if they are to germinate and grow into the new leaves. Similar conditions must prevail, in a general way, during the summer if secondary infections are to occur. These statements show, then, that leaf-spot epidemics are dependent upon rainfall, and as every season is not "wet," we do not have a leaf-spot epidemic every year.

The fact that leaf-spot does not develop to a dangerous extent every season is in a way unfortunate, as it tends to cause many growers to become lax in their spraying operations. Two or three seasons relatively free from leaf-spot are usually enough to produce this effect with many growers. In many districts during 1922 leaf-spot caused heavy losses and these losses were almost entirely avoidable, as it has been definitely proved that leaf-spot can be effectively controlled, even when in epidemic form, if proper spraying is done. Many growers, who had the reputation of doing their work thoroughly suffered heavily from leaf-spot injury. The natural thing to do under such circumstances was to locate the trouble and as most fruit growers are quite human, they did not think of laying the trouble at their own door.

It was even suggested that the materials generally used were not right, that the schedule of applications as generally recommended was wrong, and so on. If the facts could have

(Continued on page 13.)

IN MEMORIAM

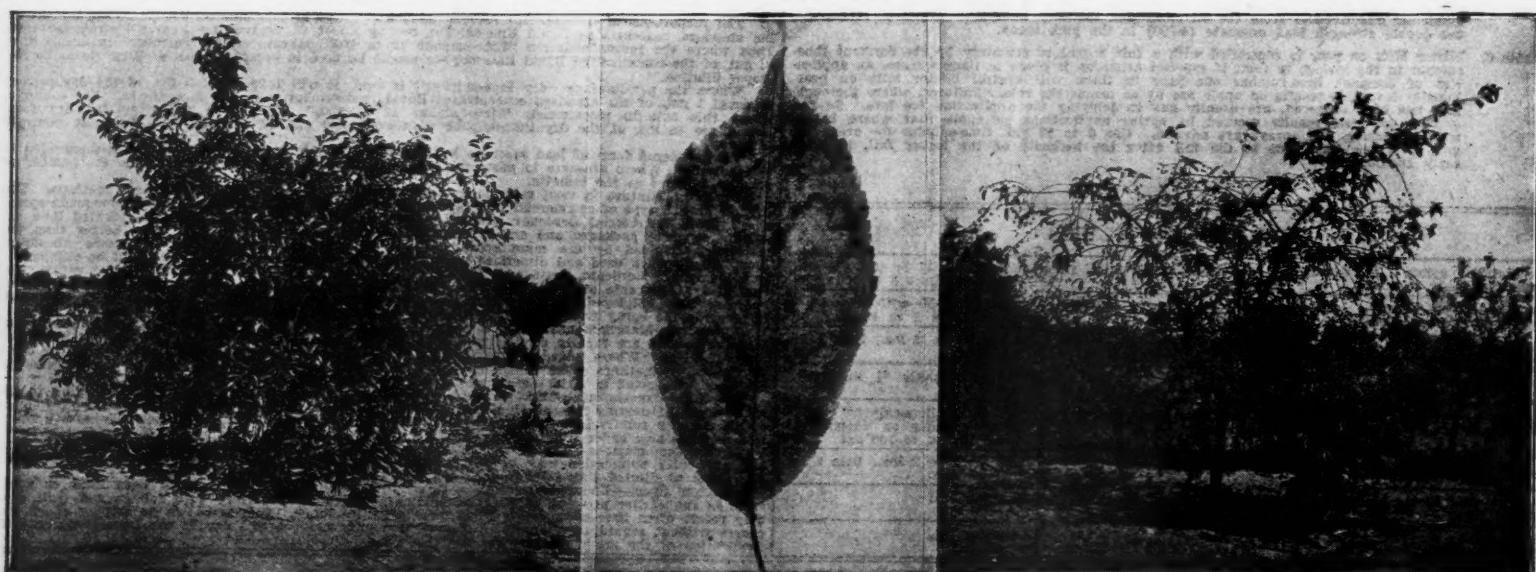
JUST as we are going to press it becomes our painful duty to announce to the readers of the AMERICAN FRUIT GROWER MAGAZINE the passing away of its managing editor, Claude I. Lewis, following an illness of about four months, during the greater part of which he was confined to his bed. Words fail us in expressing the bereavement which we feel and which we know our readers will feel over the loss of Mr. Lewis, who has for many years past been one of the most prominent figures in American horticulture. He was a man of sterling character, of great ability and of wide and varied knowledge in his chosen line.

The work of Mr. Lewis, however, lives after him. Like a star of the first magnitude, whose light would continue to reach the earth for decades even though it disappeared from its place in the heavens, the influence of Mr. Lewis will be felt for many years to come; and the AMERICAN FRUIT GROWER MAGAZINE will continue to reflect it. During his illness, and up to the very last, Mr. Lewis maintained editorial direction of the paper; and, with the freedom from office interruptions, he was able to lay out the issues of the AMERICAN FRUIT GROWER MAGAZINE for the entire year 1924, as well as to dictate letters arranging for contributions by specialists on each of the subjects provided for. There will consequently be no change in the policy or general composition of the AMERICAN FRUIT GROWER MAGAZINE, and its articles will be no less authoritative than they have been in the past. His successor as managing editor will also be a man worthy to take the place of Mr. Lewis; and, with the amount of work already done in advance for the coming year, he will be able to spend more time in traveling among the fruit growing districts and adding measurably to the service which the AMERICAN FRUIT GROWER MAGAZINE is endeavoring to perform. We feel that in this way the memory of Mr. Lewis will be best honored and his dearest wish fulfilled.

is not being planted extensively at the present time. Montmorency is quite susceptible but not so much so as English Morello. This disease is known by a number of common names, as leaf-spot, leaf-blight, yellow-

usually confined to the leaves, and it is here that the real injury is done.

The fungus is carried over winter on old leaves which were affected the previous year and the first serious infections come from them soon after



Left—A tree which has been properly sprayed and has held its foliage in good condition. Center—A cherry leaf as it appears when about ready to drop after injury by leaf-spot. Right—A tree which has been poorly sprayed; the leaves have fallen and the fruit is worthless.

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General Spray Calendar for Apples, Pears, Quinces for the Middle West

By T. J. Talbert, University of Missouri

What to Spray for	When to Spray.	What to Use							
(1) San Jose Scale. Other scale insects. Plant Lice (Aphids).	Any time after leaves drop in the fall, during pleasant weather in winter and until growth starts in spring.	Dormant or Scale Spray. Commercial liquid lime-sulphur 1 to 7 or miscible oils. This spray may be omitted if scale is not present. Arsenate of lead is not required.	Lime Sulphur Solution.—Where spray guns are used it may be advisable to dilute the lime sulphur at the rate of 1½-50 on account of danger of burning foliage and fruit. Lime-sulphur as referred to in the spray calendar means commercial solution testing about 33 degrees Baume. Lime-sulphur is more apt to burn in dry, hot weather while Bordeaux is most dangerous in cool, cloudy weather.						
(2) Plant Lice (Aphids). Apple Scab. Curculio. Canker Worms. Apple Rust. Leaf Spot. Other biting insect.	When cluster buds are separated and the pink petals show, but before the blossoms open.	First Summer or Cluster Bud Spray. Lime-sulphur (1½ to 50) see note, plus 1 lb. of dry arsenate of lead. Nicotine sulphate (½ pt. to 50 gal. of spray mixture when plant lice are abundant).	Bleach and Bitter Rot.—If the orchard is practically free from bleach and bitter rot, lime-sulphur solution may be used instead of Bordeaux in Nos. 4 and 5.						
(3) Codling Moth. Plant Lice (Aphids). Apple Scab. Leaf Spot. Curculio. Canker Worms. Lesser Apple Worm. Other biting insect.	Start when bloom is two-thirds off and finish before the blossom ends close. Most important summer spray, apply thoroughly.	Second Summer or Calyx-Cup Spray. Lime-sulphur (1½ to 50) see note, plus 1 lb. of dry arsenate of lead. Nicotine sulphate (½ pt. to 50 gal. of spray mixture when plant lice are abundant).	Sprays Required.—All the above sprays are not likely to be needed. A study of the insects and fungus diseases common in the orchard will help the grower arrange a schedule adapted to his particular needs. The sprays ordinarily needed are 2, 3, 4 and 5 in the northern half of Missouri, while in the southern half 5 or more sprays are generally required.						
(4) Apple Blotch. Sooty Blotch. Leaf Spot. Curculio. Codling Moth. Lesser Apple Worm. Other biting insect.	Within 12 to 14 days after Calyx spray. If Curculio injury is severe apply within 6 or 7 days.	Third Summer or Curculio and Blotch Spray. Lime-sulphur (1½ to 50) see note, plus 1 lb. of dry arsenate of lead. If apple blotch is severe use Bordeaux 3-4-50.	Bordeaux Mixture.—Bordeaux has reference to Bordeaux mixture made according to the 3-4-50 formula (3 lbs. bluestone, 4 lbs. quick lime to 50 gal. of water).						
(5) Apple Blotch. Sooty Blotch. Curculio. Codling Moth. Lesser Apple Worm. Other biting insect.	Apply 5 or 6 weeks after the Calyx spray, or if No. 4 is made within 6 to 10 days, apply No. 5, 2 to 3 weeks later.	Fourth Summer Spray. Lime-sulphur (1½ to 50) see note, or Bordeaux 3-4-50, plus 1 lb. of dry arsenate of lead. If apple blotch or bitter rot is serious use Bordeaux 3-4-50.	BORDEAUX MIXTURE The following formula for making Bordeaux mixture has given very satisfactory results in spraying demonstration work: <table style="margin-left: auto; margin-right: auto;"><tr><td>Blue vitriol (copper sulphate).....</td><td>3 lbs.</td></tr><tr><td>Stone lime (unslaked).....</td><td>4 lbs.</td></tr><tr><td>Water</td><td>.50 gal.</td></tr></table>	Blue vitriol (copper sulphate).....	3 lbs.	Stone lime (unslaked).....	4 lbs.	Water50 gal.
Blue vitriol (copper sulphate).....	3 lbs.								
Stone lime (unslaked).....	4 lbs.								
Water50 gal.								
(6) Codling Moth. Lesser Apple Worm. Apple Blotch. Bitter Rot. Sooty Blotch. Curculio. Other biting insect.	Apply about 2 or 3 weeks after No. 6 or 7 to 9 weeks after Calyx spray. Make later sprays at intervals of 10 days or 2 weeks, where apple blotch or bitter rot is serious.	Fifth Summer Spray. Lime-sulphur (1½ to 50) see note, or Bordeaux 3-4-50 plus 1 lb. of dry arsenate of lead. If apple blotch or bitter rot is serious use Bordeaux 3-4-50.	If only 50 gal. of the Bordeaux is to be made, dissolve the copper sulphate or bluestone in 2 or 3 gal. of water. Hot water will hasten the dissolving of the bluestone. Make the solution up to 25 gal. by adding water. Slake the lime in another container and make it up to 25 gal. with water. The two solutions should be kept separate until ready for use, when they should be poured together at the same time through a strainer into the spray barrel or tank. Bluestone may be easily dissolved over night by placing the amount needed in a gunny sack and suspending it in a barrel just beneath the water.						

Since the copper sulphate solution injures iron or tin containers, it should be prepared in stone or wooden vessels.

Where greater quantities of Bordeaux are to be made, the work may be greatly facilitated by dissolving and slaking larger amounts of copper sulphate and lime. Stock solutions containing 2 lbs. of copper sulphate and 2 lbs. of lime to the gallon may be prepared in separate barrels, or other containers, and kept for an indefinite period, if evaporation is prevented.

The most satisfactory way, however, of preparing large quantities of Bordeaux is by means of an elevated platform higher than the spray tank. On this platform may be placed the stock solution containers, dilute solution containers and other needed equipment. By elevating the stock solutions and connecting the containers by means of pipes, the mixing may be easily made by gravity. Water should also be supplied by a tank or pump.

Arsenate of Lead Paste.—The paste form of arsenate of lead may be used instead of arsenate of lead powder or the dry form. For all practical purposes, one form is as effective as the other. Since the arsenate of lead paste is 50% water, use twice the amount recommended for the dry form. Most orchardists now prefer to use the dry arsenate of lead.

General Spray Calendar for Peaches, Cherries and Plums

What to Spray For.	When to Spray.	What to Use.	
(1) Peach Leaf Curl. Brown Rot. San Jose Scale.	Any time after leaves drop in fall, during nice weather in winter and until just before growth starts in spring.	Commercial lime-sulphur (1 to 7). If scale is not present, use Bordeaux mixture (4-4-50) or lime-sulphur solution (2 to 50).	PRACTICAL HINTS TO REMEMBER IN SPRAYING APPLE TREES
(2) Curculio. Other biting insect. Peach Scab. Cherry Leaf Spot. Brown Rot. Plant Lice (Aphids).	Apply after blooming and when most of the shucks and blossoms are off the fruit.	Arsenate of lead dry ¼ lb. in self-boiled lime-sulphur (8-8-50), or in 50 gal. of water to which is added milk of lime from 2 to 3 lbs. of stone lime. Add nicotine sulphate ½ pt. to 50 gal. spray if plant-lice are injurious.	1. Weigh or measure accurately all spraying materials and use them according to directions. If it is desired to experiment, do it in a small way and remember that at least three or four seasons' results should be secured before the practice is adopted for the whole orchard.
(3) Curculio. Other biting insect. Brown Rot. Peach Scab. Cherry Leaf Spot. Plant Lice (Aphids).	Apply 6 to 10 days after shucks and blossoms are off. If curculio is not serious, 2 weeks after shucks and blossoms are off.	Self-boiled lime-sulphur (8-8-50) plus ¼ lb. of dry arsenate of lead.	2. Apply the sprays as nearly the proper time as possible and remember that the leaves and fruits are not protected unless they have been thoroughly covered with the spray. Unsatisfactory results are more often due to poor spraying than to other factors.
(4) Curculio. Other biting insect. Brown Rot. Peach Scab. Cherry Leaf Spot.	Apply 2 to 3 weeks after No. 3 or at least 3 weeks before fruit ripens.	Self-boiled lime-sulphur (8-8-50) plus ¼ lb. dry arsenate of lead.	3. Apply the spraying mixtures as soon as possible after they are diluted and mixed for use. If any of this spraying solution is left in the spray barrel or tank after the work is finished, pour it out or use it in respraying a few trees. It is not advisable to keep the diluted and mixed spraying solution until time for the next application. Chemical changes may occur in the lime-sulphur arsenate of lead or bordeaux arsenate of lead solution after standing for a time and if applied to apple trees it may russet or burn the fruit and foliage badly.

Explanation of Spray Calendar for Stone Fruits.—Where San Jose scale and Peach Leaf Curl are not present, sprays No. 2 and No. 3 will generally afford sufficient protection.

During wet season, Elberta and later varieties of peaches may need later applications of self-boiled lime-sulphur (8-8-50), but in no instance should any variety of stone fruit be sprayed with this mixture later than 3 weeks before picking time.

Preparation of Self-Boiled Lime-Sulphur:

Good stone lime (not air-slacked).....	8 lbs.
Flowers of sulphur.....	8 lbs.
Water50 gal.

Place lime in a barrel or vat. Add a bucket of water to start slackening. When slackening is well started, add another bucket or so of water, then add the sulphur. Keep lime and sulphur well stirred to prevent caking. Add water as needed to keep the mixture from drying or burning. When slackening ceases, add water to make up to 50 gal. Strain into spray barrel or tank.

Amount of Spray Needed for Trees of Various Ages.—The amount of spray required for each tree will depend upon the size of the tree and the thoroughness of the spraying work. In general the amount needed per tree for apple, pear, peach, plum and cherry trees does not differ greatly until the trees are about 10 years old. After this age is reached the apple trees will usually need from 1 to 6 or 7 gal. more spray per tree than the pear, peach, plum or cherry. Trees from 1 to 3 years old will require approximately ¼ to 1 gal. each; trees 3 to 5 years, ½ to 2 gal. each; trees 5 to 7 years, 2 to 3 gal. each; trees 7 to 10 years, 3 to 4½ gal. each; trees 10 to 14 years, 3½ to 5 gal. each; trees 14 to 18 years, 4 to 7 gal. each; trees 18 to 24 years, 5 to 10 gal. each; trees 24 years old or over may require from 8 to 14 gal. each.

How to Calculate Amount of Spray Materials to Buy.—**Dormant or Scale Spray.**—To determine the amount of lime-sulphur to purchase, multiply the number of trees about the same age by the amount per tree as estimated above. Then multiply this by the number of sprays to be made, and divide the total by 350. The result will be the number of 50-gal. barrels of concentrated lime-sulphur solution that should be purchased. A 50-gal. barrel of lime-sulphur solution diluted at the rate of 1 gal. of the concentrated solution to 7 gal. of water will make approximately 350 gal. of spray.

Lime-Sulphur for Summer Sprays.—A 50-gal. barrel of lime-sulphur solution diluted at the rate of 1½ gal. of the strong solution to 50 gal. of water will make approximately 1700 gal. of spray. To find the quantity of lime-sulphur required, calculate as indicated above by multiplying the number of trees about the same age by the amount estimated per tree. Then multiply by number of sprays to be made and divide by 1700. This will give the number of barrels to be purchased for the summer sprays.

Arsenate of Lead.—Multiply the number of trees of the same age by the estimated amount of spray needed for each tree, then multiply this by the number of sprays to be made and divide by 50. This will give the number of 50-gal. lots required. Now multiply this by 1, 2 or 3, depending upon the pounds of dry arsenate of lead or paste arsenate of lead, you expect to use for each 50 gal. of spray. The product obtained will give the number of pounds arsenate of lead to purchase.

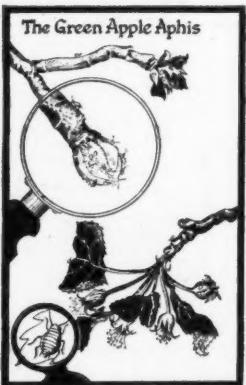
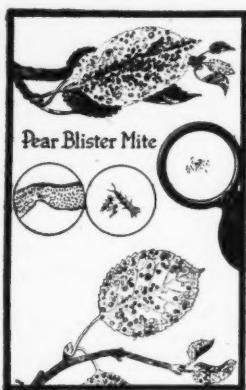
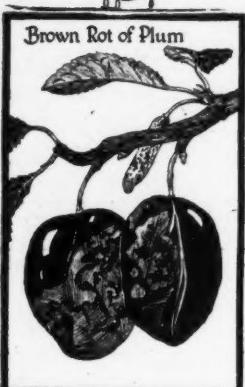
The method of preparing engine oil emulsions for use as sprays is described by Ackerman in the United States Department of Agriculture Circular 263, and by Haseman and Sullivan in Missouri Agricultural Experiment Station Circular 109. The oil, water and soap are heated to boiling and emulsified by pumping. Oil emulsions made as described in these publications are said to be made according to the "government formula." If used with hard water, or with lime-sulphur, such emulsions break down and free oil arises to the surface of the spray mixture. The separation of free oil may be prevented by the addition of Bordeaux mixture, copperas-lime mixture, starch, flour, saponin, glue, casein, "Kays" and other substances.

In the course of experimental work by the department of horticulture of the Missouri Agricultural Experiment Station, at Columbia, it has been found that oil emulsions can be made without the potash fish-oil soap, and without heating. The materials which have been used as stabilizers have been found to act as emulsifiers, just as the soap does.

Inasmuch as the Missouri cold emulsions can be prepared more cheaply and easily than the oil-soap emulsions, they are very promising as a spray for the control of San Jose Scale. Missouri Agricultural Experiment Station Bulletin 205 (1923) by A. M. Burroughs, presents the results of one year's work with the Missouri cold emulsions and gives directions for their preparation and use in order that fruit growers who so desire may give them a trial.

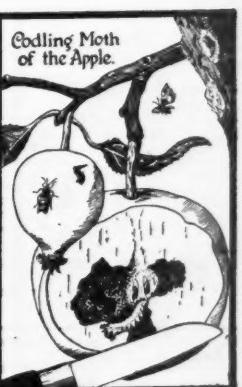
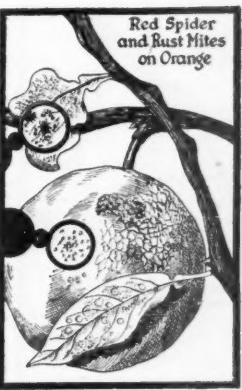
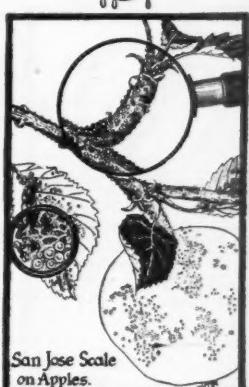
NEW OIL SPRAYS FOR SAN JOSE SCALE CONTROL

S-W SPRAYING GUIDE



FRUIT or VEGETABLE	PEST	WHAT TO USE	DILUTION	WHEN TO SPRAY
APPLE	San Jose Scale	Dry Lime-Sulfur	12 to 15 lbs.	In fall after leaves drop or in spring when buds are showing "tip-green."
	Coddling Moth	Dry Arsenate of Lead	1 to 1½ lbs.	(1) At fall of the blossoms before the calyx closes. (2) Three weeks after fall of blossoms. (3) Ten weeks after fall of blossoms. (4) Fourteen weeks after fall of blossoms. (5) Seventeen weeks after fall of blossoms.
	Cankerworm	Dry Arsenate of Lead	1 to 2 lbs.	(1) Just before blossoms in cluster-bud. (2) At fall of blossoms.
	Bitter-Rat	Fungi-Borde	8 lbs.	Spray about the middle of June and keep fruit coated the rest of the season.
	Blotch	Dry Lime-Sulfur or Fungi-Borde	3 to 4 lbs. 8 lbs.	(1) Three weeks after fall of blossoms. (2) Five weeks after fall of blossoms.
APRICOT	Scale	Dry Lime-Sulfur	3 to 4 lbs.	(1) Just before blossoms in cluster-bud. (2) At fall of blossoms. (3) Within a week or ten days later.
	Fruit Tree Leaf Roller	Spra-Mulsion	4 to 5 gals.	Prior to but at near hatching time of eggs as possible. Before buds open.
	Powdery Mildew	Dry Lime-Sulfur	3 to 4 lbs.	(1) When bud clusters begin to show pink. (2) At fall of the blossoms. (3) About 15 days later.
	Athrips	(1) Fungi-Borde (2) Spra-Mulsion	(1) 6 to 8 lbs. (2) 10 to 12 lbs.	(1) Before the fall rains begin. (2) After the crop is picked.
	Aphis	(1) Spra-Mulsion (2) Spra-Mulsion and Nicotine Sulfate	(1) 3 to 4 gals. (2) 1 to 1½ gals. ½ pint	(1) In fall after leaves drop or in spring before buds open. (2) As soon as discovered—about the time when first leaves are unfolding.
PEACH	Apricot Brown Rot	Fungi-Borde	10 to 12 lbs.	(1) Important to spray just as first blossom buds are opening. (2) When trees are about one-fourth in bloom.
	Brown Apricot Scale	Spra-Mulsion	3 to 4 gals.	In fall after leaves drop or in spring before buds swell.
	Apricot Worm	Dry Lime-Sulfur or Dry Arsenate of Lead	12 to 15 lbs.	Just before buds open.
	Shot Hole Fungus	Fungi-Borde	8 to 10 lbs.	In fall after leaves are off.
	Curculio	Dry Arsenate of Lead and Lime	1 lb. 3 lbs.	(1) When first shucks are pushing off. (2) Again when all shucks are off. (3) Three or four weeks after fall of blossoms.
PEAR	Brown Rot	Self-Boiled Lime and Sulfur	6 lbs. of each	(1) When all shucks are off. (2) Three or four weeks after fall of blossoms.
	Scab	Self-Boiled Lime and Sulfur	8 lbs. of each	Spraying for Brown Rot controls Scab.
	Leaf Curl	Dry Lime-Sulfur	12 to 15 lbs.	Either in fall after leaves drop or in spring before buds swell.
	Peach Blight	Dry Lime-Sulfur or Fungi-Borde	12 to 15 lbs. 8 to 10 lbs.	In fall after leaves drop—before December 1st.
	Twig Borer	Dry Lime-Sulfur	12 to 15 lbs. Add 1 pound of Dry Arsenate of Lead and 2 tablespoons of Molasses to each gallon.	Same as for Leaf Curl.
PLUM	Slug	Dry Arsenate of Lead	1 lb.	When slugs appear.
	Pear Leaf-Blister Mite	Dry Lime-Sulfur	12 to 15 lbs.	In fall after leaves drop or in the spring before buds burst.
	Scab	Dry Lime-Sulfur	3 to 4 lbs.	(1) Just before blossoms in cluster-bud. (2) At fall of blossoms. (3) Two weeks later.
	Curculio	Dry Arsenate of Lead	1 lb.	(1) Just before blossom buds open. (2) At fall of blossoms. (3) A week later.
	Brown Rot	Dry Lime-Sulfur	9 lbs.	(1) Just before buds open. (2) Immediately after blossoms fall. (3) Ten days to two weeks later. If season is wet, spray every two weeks until month before picking time.
PRUNE	Leaf Spot	Dry Lime-Sulfur	3 lbs.	(1) Ten days after fall of blossoms. (2) Three weeks later. (3) Six weeks after fall of blossoms.
	Brown Apricot Scale	Spra-Mulsion	3 to 4 gals.	In fall after leaves drop or in spring before buds swell.
	Italian Pear Scale	Spra-Mulsion	3 to 4 gals.	Same as for Brown Apricot Scale.
	Moss and Lichens	Spra-Mulsion and Caustic Soda	3 to 4 gals. 1 to 2 lbs.	Same as for scale—when trees are dormant. Dissolve caustic in the water first, then add Spra-Mulsion.
	Thrips	Spra-Mulsion and Nicotine Sulfate	1 to 1½ gals. ½ pint	Same as for Pear.
CHERRY	Red Spider	Dry Lime-Sulfur	3 to 4 lbs.	When spiders appear in numbers about July.
	Cherry Slug	Dry Arsenate of Lead	1 lb.	When slugs appear.
	Curculio	Dry Arsenate of Lead	1 lb.	(1) At fall of blossoms. (2) A week to ten days later.
	Brown Rot	Dry Lime-Sulfur	3 to 4 lbs.	(1) Just before the blossoms. (2) At fall of blossoms. (3) A week to ten days later. (4) When fruit begins to color.
	Rose Chafer	Dry Arsenate of Lead and Molasses	2 lbs. 1 gal.	At first appearance of beetles and one week later if beetles are still present.
GRAPE	Grape Berry Moth	Dry Arsenate of Lead	½ lbs.	(1) Just before fruit sets. (2) About ten days later. (3) Mid-July.
	Black Rot	Fungi-Borde or Pestrey	8 lbs. 9 lbs.	(1) When second or third leaf is showing. (2) Before the blossoms open. (3) After fall of blossoms. (4) About ten days to two weeks later. (5) Again in ten to fourteen days.
	Powdery Mildew	Dusting Sulfur		(1) When shoots are 9 to 12 inches long. Early in June as larvae appear. (2) After blossoming and fruit has set.
	Sphinx Moth	Dry Arsenate of Lead	1 to 1½ lbs.	
	Currant Worm	Dry Arsenate of Lead	1 to 1½ lbs.	When worms first appear.
CURRENT and GOOSEBERRY	Powdery Mildew	Dry Lime-Sulfur	3 lbs.	(1) When buds burst. (2) At ten-day intervals until five applications have been made.
	Leaf Roller	Dry Arsenate of Lead	1½ lbs.	A week after moths appear.
	Leaf Spot	Fungi-Borde	8 lbs.	(1) Before blossoms open. (2) Ten days to two weeks later.
	Raspberry	Dry Lime-Sulfur	4 lbs.	(1) When new shoots are six inches high. (2) When ten inches high. (3) Just before bloom.
				Begin when plants are six inches high and thereafter at 10-day intervals until 4 or 5 sprays have been applied.
POTATO	Colorado Potato Beetle	Tuber Tonic or Pestrey	3 lbs. 9 lbs.	
	Leaf-Hopper	Arsenate of Calcium Dusting Sulfur Hydrated Lime	1 Part 1 to 4 Parts	When beetles and eggs appear, apply as a dust.
	Blight	Fungi-Borde	0 lbs.	While original seed parts are still on seedlings.
	Anthracnose			
BEAN	Tomato Worms	Dry Arsenate of Lead	1 to 1½ lbs.	When worms appear.
	Leaf Spot	Fungi-Borde	0 lbs.	At setting time and at two-week intervals up to picking season.
	Thrips	Nicotine Sulfate and Soap	½ pint and 2½ lbs.	Spray frequently in crevices of plants.
	Mildew	Fungi-Borde	6 lbs.	Spray frequently.
TOMATO	Cabbage Worms	Dry Arsenate of Lead and Soap	1 lb. 5 to 6 lbs.	When worms appear.
	Asparagus	Asparagus Beetle	6 lbs.	Leave every tenth row uncut and spray from both sides. Apply three or four sprays at frequent intervals.
	BEET	Fungi-Borde	6 lbs.	Early in spring when plants are small.
	CELERY	Fungi-Borde	6 lbs.	Spray frequently.
	CUCUMBER	Pestrey	7 lbs.	Spray frequently to repel beetles.
ONION	Eggplant	Pestrey	7 lbs.	Frequent applications.
	MUSKMELON or CANTALOUP	Aphis	Nicotine Sulfate ½ pint	When lice appear. Spray undersides of leaves.
	PEPPER	Rot	Fungi-Borde	6 lbs.
				Spray two or three times during fruiting season.

All dilutions on basis of amount per 50 gallons of spray.



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The Sherwin-Williams Co., Dept. B 458, 640 Canal Rd., N. W., Cleveland, Ohio



Spray Table for Northern California

By Warren P. Tufts, Assistant Professor of Pomology, University of California

(NOTE: The following material is largely summarized from Circular No. 227 of California College of Agriculture, by Horne and Essig)

ALMOND				CHERRY			
What to Spray For.	What to Use.	When to Spray.	Remarks.	What to Spray For.	What to Use.	When to Spray.	Remarks.
Shot Hole Rust.	Lime-sulphur 1 to 10.	Just as buds are swelling.		Bacterial Gummosis.	See under "Apricot."		Spraying ineffective.
Calif. Peach Borer.	See under "Peach."			Leaf and Fruit Spot (Shot Hole).	See under "Apricot."		
Peach Twig Borer.	See under "Peach."			Black Cherry Aphid.	(1) Nicotine sulphate, 1 pt.; fish oil soap, 4 to 5 lbs.; 100 to 150 gal. water or dust with 5% Nicodust.	As soon as aphids appear.	Dusting must be thorough.
Red Humped Caterpillar.	See under "Prune."			Cherry Fruit Sawfly.	Powdered arsenate of lead, 3 lbs. to 100 gal. water.	When petals are opening.	
Red Spider.	(1) Lime-sulphur 1 to 10 or crude oil emulsion. (2) Lime-sulphur 1 to 50 or sulphur paste 8 to 21 lbs. to 100 gal. water.	(1) During dormant season when trees are leafless. (2) As soon as mites appear and as often as necessary during the summer.	(1) To kill eggs of the Bryobia. Crude oil emulsion most effective. Distillates and miscible oils not effective. (2) To kill adults of the Tetranychus.	Cherry Slug.	(1) Powdered arsenate of lead, 2 lbs. to 100 gal. water. (2) 2 to 5% Nicodust.	When slugs appear.	An easy insect to control.
APPLE				FIG			
Pear Blight.	See under "Pear."		Spraying ineffective.	Smut.	No remedy known.		
Mildew.	Lime-sulphur 1 to 35 or sulphur paste 8 lbs. to 100 gal. water.	When petals fall. Several times throughout the spring.	Sulphur sprays cause injury to apple tree in some sections of California. Cut out all diseased twigs at pruning time.	Souring and Splitting.	Due to unfavorable atmospheric or soil moisture conditions.		
Scab.	(1) Bordeaux 5-50 or lime-sulphur 1-20. (2) Lime-sulphur, 1-35.	(1) As blossoms open. (2) As petals fall.	Later sprayings may be necessary in coastal sections.	Mediterranean Fig Scale.	Distillate Emulsion or miscible oil or crude oil emulsion.	During dormant season.	
Codling Moth.	(1) 2½ lbs. powdered arsenate of lead to 100 gal. water. (2) Same strength as No. 1. (3) 2 lbs. powdered arsenate of lead to 100 gal. water.	(1) As petals fall. (2) Three weeks later. (3) As needed.	In many sections of California 2 sprays are sufficient. In other locations, 4 or 5 sprays are necessary. Watch for new larvae and spray accordingly. Time varies according to locality.				
Flat Headed Apple Tree Borer.	Borers only attack sunburned or other dead areas.		Spraying ineffective. White wash trunks to prevent sunburn. Tree protectors more efficient.				
Fruit Tree Leaf Roller.	Miscible or crude oil spray.	During dormant season, when trees are leafless, to kill eggs.	Thoroughly drench limbs, particularly top and outside branches.				
Green and Rosy Apple Aphid.	(1) Lime-sulphur 1 to 10. (2) Nicotine sulphate 1 pt., fish oil soap 4 to 5 lbs., water 100 to 150 gal. (3) 5 or 6% Nicodust.	(1) Late dormant just before buds open. (2) From bursting of the buds until leaf buds are one-half inch long. (3) Same as No. 2.	(1) Fair results in killing eggs. (2) Results in somewhat better control than (1). (3) Dust thoroughly.				
Red Humped Caterpillar.	See under "Prune."						
Scale Insects.	(1) Lime-sulphur 1 to 10. (2) Crude oil emulsion. (3) Distillate emulsion. (4) Miscible oil.	During dormant season, when trees are leafless.	For San Jose Scale alone lime-sulphur is sufficient. For a mixed infection of scales use an oil spray; the heavier oils are more efficient.				
Tussock Moth.	Destroy egg masses during winter. Jar from trees and prevent reascending by banding trees with cotton, wire screen or tanglefoot.		Spraying ineffective.				
Woolly Apple Aphid.	Distillate emulsion or miscible oil.	During dormant season when trees are leafless.	For root form open up around trunk and pour in 4 to 5 gal. of spray. Delicious and Northern Spy roots are somewhat immune. See also under "Peach" Calif. Peach Root Borer.				
APRICOT				GRAPE			
Bacterial Gummosis.	Remove infected areas. Freely disinfect tools and wounds with 1 part mercuric cyanide, 1 part bichloride of mercury, 500 parts water.	Shave off outer bark for some distance and scrape to wood wherever cambium is killed.	Spraying ineffective.	Grape Mildew.	Finest forms of dry sulphur.	When new shoots are 6 in. long, and again just before the blossoms open.	In cool or moist locations a third sulphuring when the grapes are as large as peas and a fourth when two-thirds grown.
Brown Rot.	(1) Bordeaux, 8-50. (2) Bordeaux, 4-50.	(1) When 1-5 of blossoms are open. (2) During full bloom or even after in bad cases if weather continues damp.	During fall and winter remove infested twigs and mummies. Sulphur sprays should be avoided, often causing small fruit.	Calif. Grape Root Worm.	Powdered arsenate of lead, 3 lbs. to 100 gal. water.	As soon as beetles appear in spring.	Cultivate thoroughly close to vines during winter to kill larvae.
Shot Hole (Peach Blight).	(1) Bordeaux, 5-50. (2) Bordeaux, 5-50.	(1) After first rains, Nov. 15-Dec. 15. (2) In spring when buds are showing pink.		Grape Leaf Hopper.	(1) Nicotine and soap or nicotine sulphate, 1 lb.; liquid soap, ¼ gal.; water, 200 gal. (2) Thoroughly dust with 10% Nicodust.	(1) Before young nymphs develop wings. (2) When adults appear.	In place of 10% Nicodust may use 6% nicosulphur dust which latter will also control mildew.
Brown Apricot Scale.	Crude oil emulsion or distillate emulsion or miscible oil.	During dormant season when trees are leafless, December to February.	Thoroughness of application is necessary. Do not spray before winter rains begin even if that is not before January or February.	Grape Phylloxera.	Use resistant vines. Disinfect cuttings or rootings before planting by dipping in hot water, 122 degrees Fahrenheit for 5 min.		Spraying ineffective.
Calif. Peach Root Borer.	See under "Peach."			Mealy Bug.	Difficult to control but best results have been obtained by burning sulphur under a tent over the vines.		
Fruit Tree Leaf Roller.	See under "Apple."						
Peach Twig Borer.	See under "Peach."						
Red Humped Caterpillar.	See under "Prune."						
OLIVE				PEACH AND NECTARINE			
Olive Knot.	Cut out thoroughly at first appearance and disinfect.			Blight Leaf Curl.	(2) Bordeaux, 5-50. (2) Lime-sulphur 1 to 10.	(1) After first fall rains, Nov. 15 to Dec. 15. (2) Just as buds are showing green in spring.	Peaches cannot be sprayed after leaves appear with these sprays without injury. The fall spray is the most important for Blight; the spring spray for Leaf Curl.
Black Scale.	See under "Apricot."			Brown Rot.	See under "Apricot."		
				Powdery Mildew.	See Apple Mildew.		
				Black Peach Aphid.	Nicotine and soap or dust with 5% Nicodust.	As soon as insects appear.	
				Black Scale.	See under "Apricot."		
				Brown Apricot Scale.	See under "Apricot."		
				Flat Headed Apple Tree Borer.	See under "Apple."		
				Peach Rust Mite.	Lime-sulphur 1 to 10.	During dormant season.	

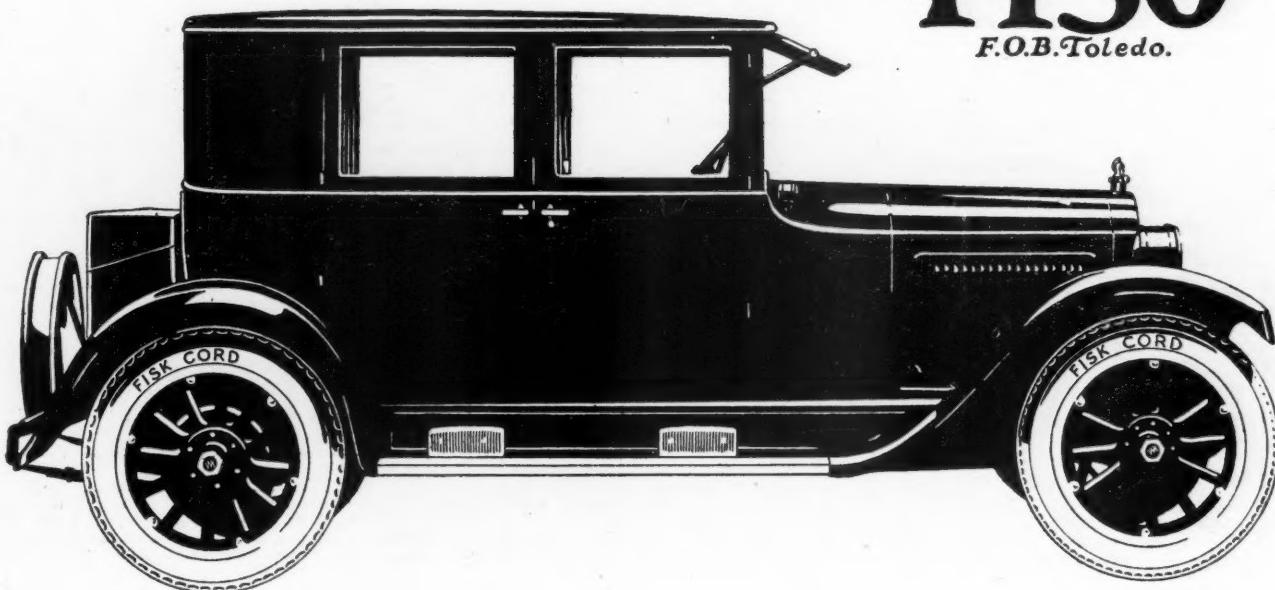
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THE DAY OF THE KNIGHT IS HERE

Spray Table for Northern California

(Continued from page 10.)

PEACH AND NECTARINE—Continued

What to Spray For.	What to Use.	When to Spray.	Remarks.
Calif. Peach Root Borer.	Spraying ineffective. Use 1 oz. Parathion-chlorobenzene to the tree, spreading in a ring around the trunk, being careful to keep the material 3 inches from the trunk of the tree. Cover with 5 inches of soil mounding around trunk.	This remedy should be applied in the early fall before the ground becomes moistened.	Spraying ineffective. Increase the dosage for very large trees.
Peach Twig Borer.	Lime-sulphur 1 to 10.	As blossom buds begin to open.	Addition of 3 lbs. powdered arsenate of lead per 100 gal. increases effectiveness.
Red Spider.	See under "Almond."		
San Jose Scale.	See under "Apple."		
Wheat Thrips.	See under "Pear."		

PEAR

Black End.	No remedy known. Give good care especially as to drainage.		In many cases lack of sufficient moisture may possibly be cause.
Blight.	Spraying ineffective. Cut out all infected parts thoroughly. Especially remove all "old over" in limbs, trunk and roots during the winter. Disinfect tools and cuts freely; mercuric cyanide and corrosive sublimate 1 part of each to 500 of water in a mixture consisting of $\frac{1}{2}$ glycerine and $\frac{1}{4}$ water. In future plantings, topwork on resistant stocks.		New cankers in which cambium is not injured may be arrested by paring off the outer bark very thoroughly and applying the disinfectant. Large branches may usually be saved.
Scab.	Lime-sulphur 1 to 12 or Bordeaux 5-6-50.	(1) Just as cluster buds are opening. (2) Repeat when first blossoms are opening.	Later sprays may be necessary in moist localities.
Brown Apricot and other soft scales.	See under "Apricot."		
Cherry or Pear Slug.	See under "Cherry."		
Coddling Moth.	See under "Apple."		
Fruit Tree Roller.	See under "Apple."		
Green Apple Aphis.	See under "Apple."		
Italian Pear Scale.	Crude oil emulsion or distillate emulsion or miscible oil.	During dormant season, January or February.	Crude oil emulsions are best. Thoroughly drench limbs and trunks.
Pear Leaf Blister Mite.	Lime-sulphur 1 to 10.	November or February.	In most sections the November or early December spray gives greater control than the February spray.
Pear Root Aphids.	See under Woolly Apple Aphis under "Apple."		Japanese pear root is more resistant to this pest than the French pear root.
Pear Thrips.	Distillate emulsion 10 gal., Nicotine 1 pt., water to make 200 gal. Or dust with 5 or 6 per cent Nicodust repeatedly.	As soon as "black" thrips appear in the blossoming buds as the latter begin to open. Spray as often as necessary.	Carefully watch buds for infestation prior to opening.
Red Humped Caterpillar.	See under "Prune."		
San Jose Scale.	See under "Apple."		Treatment for the Italian pear scale will also control San Jose Scale.

PLUMS AND PRUNES

Brown Rot.	See under "Apricot."		Not often serious.
Scale Insects.	See under "Apple and Apricot."		
Calif. Peach Root Borer.	See under "Peach."		
Cherry Fruit Sawfly.	See under "Cherry."		

PLUMS AND PRUNES—Continued

What to Spray For.	What to Use.	When to Spray.	Remarks.
Citrus Red Spider.	See Red Spider under "Almond."		
Flat Headed Apple Tree Borer.	See under "Apple."		
Fruit Tree Leaf Roller.	See under "Apple."		
Italian Pear Scale.	See under "Pear."		
Mealy Plum Louse.	6 lb. fish oil soap to 100 gal. of water.	When insects appear in May and June.	Spraying must be done promptly before leaves are curled. The soap spray appears to give satisfactory results and is cheaper than the nicotine soap spray.

Peach Twig Borer.	See under "Peach."		
Pear Thrips.	See under "Pear."		
Red Spider.	See under "Almond."		
Red Humped Caterpillar.	1. 5 lb. powdered basic arsenate of lead, water 100 gal. 2. Dust with dry arsenate of lead, diluted with powdered hydrated lime.	Whenever insects appear.	This pest is difficult to control. Close boeing around trunks of trees during fall and spring will kill many hibernating larvae.
Tussock Moth.	See under "Apple."		

WALNUT

Blight.	No specific remedy. Plant resistant varieties.		
Coddling Moth.	See "Apple." 1. Basic arsenate of lead 3 lbs. to 100 gal. water. 2. Or dust with powdered arsenate of lead and hydrated lime.	When the work of the insect is first observed in May and July.	Time of application depends upon climatic conditions.
Red Humped Caterpillar.	See under "Prune."		
Walnut Aphis.	Dust thoroughly with 2% Nicodust.	Last week of May or first part of June.	Sometimes second application is necessary in July or August.
Walnut Blister Mite.	Lime-sulphur 1-10.	When buds are swelling in spring.	Not a serious pest.

BUSH FRUITS (Blackberry, Loganberry, Raspberry)

Leaf Spot.	1. Bordeaux 5-5-50. 2. Lime-sulphur 1-10.	During dormant season.	Cut out and burn infected parts in fall. Renew old plantings. This disease sometimes confused with anthracnose which has not yet been identified in California.
Orange Rust.	Cut off diseased plantings below surface of the ground and burn. Bordeaux spraying is to prevent infection of healthy plants.		
Raspberry Horn-tail.	Spraying ineffective. Cut off wilted tips as soon as noticed and burn. Remove all dead canes in winter, using care to dig out the borers at that time.		
Rose Scale.	Distillate emulsion or miscible oil.	During dormant season.	Prune out old canes every year. Pest only serious where pruning is not regularly practiced.

CURRENTS AND GOOSEBERRIES

Mildew.	Lime-sulphur 1-33.	As buds commence to open and two or three times thereafter at intervals of 10 to 14 days.	In California use resistant varieties. Lime-sulphur 1-10, followed by a dusting with sulphur when the disease first appears has generally been effective.
Currant and Gooseberry Fruity.	Spraying ineffective. Cultivate thoroughly during fall, winter and spring months.		
Imported currant Borer.	Spraying ineffective. Cut out and burn all infected canes during the winter and remove the borers.		
Red Spider.	Dust with sulphur or spray with wettable sulphur or sulphur paste.	When insects appear.	

STRAWBERRIES

Leaf Spot.	Bordeaux 5-5-50.	During dormant season.	Clean up and burn leaves in late fall. Spraying necessary only in cases where disease is serious.
Strawberry Aphid.	5% Nicodust.	When aphids appear.	Apply dust to under side of leaves. Defoliate plants in fall.
Strawberry Crown Moth.	Spraying ineffective. Be sure of clean nursery stock. Remove and burn infected plants as soon as discovered.		
Strawberry Leaf Beetle.	Established infestations may be reduced by thoroughly spraying with powdered basic arsenate of lead 3 lb. to 100 gal. of water, or dust with 1 part of basic powdered arsenate of lead to 4 parts of powdered hydrated lime. It is a severe pest and should be eradicated if possible by destroying all infested vines.		
Red Spider.	Thoroughly controlled with dry sulphur. However, this cannot be used on strawberries because of severe burning of the foliage. Very small amount of sulphur in ditches between rows affords some relief.		

Notes on Spray Machinery

(Continued from page 3.)

that the nine or twelve-gallon capacity accredited to machines by their makers is not intended to represent their every-day performance, it is rather the maximum performance of the machine when everything functions 100 per cent. In daily operation, a grower should figure on a 15 to 30 per cent reduction from the catalog rating in pump delivery. If you have not checked your pump

capacity recently, measuring the output of your nozzles in a pail or milk can will be worth while. If you get a seven and one-half or eight-gallon test from an outfit rated at nine and one-half gallons, you are getting good results. If your test falls below seven and one-half gallons, hold a watch on one of the pump cylinders, and count the number of strokes per minute. Then consult your catalog or book of directions and find the right pump speed for that model. If the pump is working too slowly, the engine may

be speeded up to advantage. If the pump speed is not at fault, examine your packing and cylinders for wear, then any other part of your outfit which might reduce the flow of liquid.

We cannot leave the subject of guns and their relation to spray machinery without referring to a popular notion about them. Many assume that because a stream of spray may be projected from them to a height of 26 or 28 feet, that thorough spraying can be accomplished in tall trees. In comparative tests at Hood River Ex-

periment Station, Hood River, Ore., it was found that guns and rods were equally effective up to a height of 22 feet in the tree. Above that height neither one was effective when operated from the ground. The common opinion that the gun has greater height range than the rod is apparently unfounded, according to this and other tests. This leads to the suggestion that the spraying tower, discarded by many with the advent of the gun, should be reinstated as an (Continued on page 12.)

Cherry Diseases and Their Control

(Continued from page 6.)

been determined in each instance, there is little question but that the trouble could have been laid to one or more of the following conditions: First, applications were not made on time; second, the trees were not thoroughly sprayed; or, third, the trees were not sprayed often enough.

This all goes back, then, to the statement made earlier, that the failure of leaf-spot to develop seriously every year tends to cause laxness in control work and the grower unconsciously lets his standard of spraying drop. The same thing has happened with other fruits. The grape growers of southwestern Michigan had not been bothered with black-rot since 1917; many growers sprayed less and less each year until in 1922 an epidemic of black-rot developed and the growers who had become lax suffered heavy losses from it. It was fortunate, however, for both the grape and cherry growers that there were that year demonstrations by experiment stations and by wide-awake growers that thorough spraying is still effective.

Effects of Defoliation by Leaf-spot.

The loss of leaves as a result of injury by leaf-spot may affect the trees in one or more of several ways, here noted:

First, if defoliation is heavy early in the season the fruit will never mature to a marketable condition. The first result, then, is an immediate one which affects the crop of the current season.

Second. Defoliated trees are greatly in danger of being killed during the succeeding winter, if conditions are severe.

Third. If the trees are not killed during the winter, the crop for the succeeding year will be greatly reduced, and

Fourth. The vigor of the trees is so lowered that they will form very few lateral leaf buds, which means that there will be little development of spurs and if lateral spurs are not developed, the fruiting area of the tree is rapidly reduced and pushed to the outer surface of the tree.

It can be seen at a glance that severe defoliation may mean the loss of the current season's crop, the possible death of the trees during the winter, or if the tree does not die, the crop will be reduced during succeeding years.

Methods of Controlling Brown-Rot and Leaf-Spot.

There are two general methods of attack in controlling brown-rot and leaf-spot. The first consists of disposing of all old leaves and fruit which may carry the fungus over from one season to another. In the case of brown-rot, any old mummies which hang to the trees should be knocked or picked off and they, with any that are on the ground, should be buried several inches under the ground. This should be done before the blossoms open. The leaves, which harbor the leaf-spot fungus should be plowed under also, and this may be accomplished at the same time that the brown-rot mummies are disposed of. Controlling diseases by sanitary or clean-up methods is very good in theory and should not be neglected, but complete control cannot be hoped for as a few leaves or a few mummies will be left so that there is always a source of infection.

Spraying.

Spraying is by far the most important means of controlling these diseases and should never be neglected or done in a half-hearted way as there is no known way of predicting just what the conditions will be during any given season.

There is a wide difference of opinion as to the best spraying material to use on cherries. In some districts, Bordeaux is the favorite, in others, lime-sulphur is used more. It frequently happens that one grower will

(Continued on page 24.)

Why, Without Realizing It, You May Need

for Economical Transportation



There are three main groups of prospective buyers of Chevrolet automobiles and commercial cars.

First, are all who know from comparisons or through the experiences of friends that Chevrolet provides the utmost dollar value in modern, economical transportation of people or merchandise. This group constitutes our spontaneous market; its members walk right into our dealers' places of business and buy Chevrolet cars.

Second, the large group of people with modest incomes who have the false impression that so good a car as Chevrolet is beyond their means.

They do not realize that due to engineering excellence and full modern equipment, Chevrolet operating and maintenance costs average so low that during the life of the car, it delivers modern, com-

fortable, fast transportation at the lowest cost per mile, *including the purchase price*.

The tremendous growth of our business during the last two years has been due to the shifting of thousands from this group to the first group.

Third, the smaller but very important group of people of ample means, able to buy the highest priced cars, only a small percentage of whom as yet realize that Chevrolet combines quality features of much higher priced cars with such operating economy that as an extra car it virtually costs them nothing, due to the reduction in their transportation expenses effected by it.

This message, then, is addressed to all in the second and third groups. We respectfully suggest consideration, investigation and comparison of Chevrolet with any other car at any price. The result will be to our mutual benefit.

Chevrolet Motor Company, Detroit, Michigan

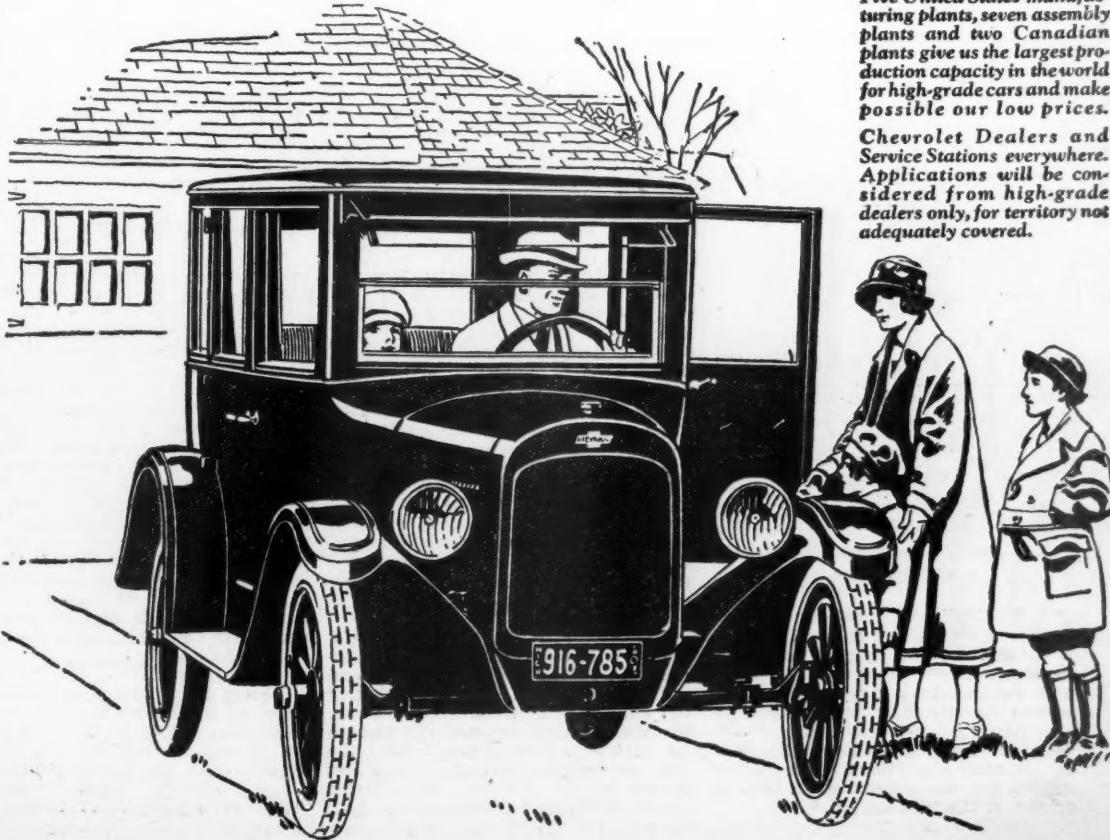
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Superior Roadster	\$490	Superior Sedan	\$795
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Dusting Calendar

By W. C. Dutton, Michigan Agricultural College

The Dusting Calendar is given for the benefit of those growers who wish to use the dusting method for all or part of the summer applications. If the spraying method is to be used for part of the applications, it is suggested that such applications be made at the periods for which a choice of dusting and spraying materials is offered, as for the pre-blossom applications on apples and pears.

APPLES

Application.	For.	Materials.
(1) Dormant.	Scale insects.	Any standard material for dormant spraying.
(2) Prepink. Just before blossom buds begin to separate in the clusters.	Apple Scab.	Lime-sulphur solution, 1½-50, superfine sulphur dust or dehydrated copper sulphate dust (15%).
(3) Pink or cluster. Just after buds have separated in the clusters.	Apple Scab and certain chewing insects.	Lime-sulphur solution, 1½-50, plus 1 to 1½ lbs. lead arsenate powder, 90-10 sulphur lead dust or dehydrated copper sulphate dust (15%) with 10% lead arsenite.
(4) Calyx application. Just after petals have dropped.	Apple Scab, codling moth and other chewing insects.	85-15 sulphur-lead dust.
(5) Ten days after (4).	Apple Scab, codling moth and other chewing insects.	85-15 sulphur-lead dust or dehydrated copper sulphate dust (15%) with 15% lead arsenite.
(6) Ten days to 2 weeks after (5).	Same as (5).	90-10 sulphur-lead dust or dehydrated copper sulphate dust with 15% lead arsenite.
(7) Eight to 10 weeks after (4). Each time must be determined locally according to emergence of the second brood of codling moth.	Codling moth and apple scab.	85-15 sulphur-lead dust or copper sulphate dust, with 15% lead arsenite.
(8) Three to 4 weeks after (7).	For codling moth in seasons or in districts where injury by this insect is apt to be severe.	Same as (7).

NOTE.—If aphids or red bugs are present, nicotine sulphate should be used with the spray or dust in the "pink application" and usually again in the dust at the "calyx application."

PEARS

(1) Dormant or	Scale insects.	Lime-sulphur solution, 6½-50 or other standard dormant spray.
(1) Delayed dormant, if pear scab or pear psylla are present. Just before blossom buds begin to separate.	Scale insects, scab, psylla eggs and blistermite.	Lime-sulphur solution, 6½-50. Spray very thoroughly to insure covering all psylla eggs.
(2) Pink or cluster application. Just after blossom buds have separated in the cluster.	Pear scab.	Bordeaux, 3-6-50 formula, superfine sulphur dust or dehydrated copper sulphate dust (15%) with 10% lead arsenite.
(3) Calyx application. Just after petals have dropped.	Pear scab, codling moth.	90-10 sulphur lead dust or dehydrated copper sulphate dust (15%) with 10% lead arsenite.
(4) Ten days to 2 weeks after (3).	Same as (3).	Same as (3).
(5) Two weeks after (4).	Pear scab.	Sulphur dust or dehydrated copper sulphate dust (15%).
(6) Same time as determined for No. 7 on apples. On varieties very susceptible to scab or in seasons favorable to codling moth development.	Pear scab and codling moth.	90-10 sulphur lead dust or dehydrated copper sulphate dust (15%) with 10% lead arsenite.

NOTE.—If pear psylla are present during the summer, their numbers may be reduced, when in the adult form, by a thorough application of a 2 to 2½% nicotine sulphate dust.

PEACHES		
Application.	For.	Materials.
(1) Dormant. Late fall or very early spring.	Leaf curl and scale insects.	Lime-sulphur solution, 6½-50.
(2) Just as the last of "shucks" are falling.	Curculio and Brown Rot.	80-10-10 sulphur-lead-lime dust.
(3) Two weeks after (2).	Curculio and Brown Rot.	Same as (2).
(4) About one month before harvest.	Brown Rot and Peach Scab.	Superfine sulphur dust alone or diluted with 10% of hydrated lime or other inert material.
(5) One week to 10 days before harvest.	Brown Rot and Peach Scab.	Same as (4). This is of particular value on varieties susceptible to Brown Rot in reducing the development of rot both before and after harvest.

NOTE.—This schedule is adapted to districts where curculio is controllable without great difficulty. In the southern districts where curculio is a serious menace, it will probably be desirable to make more frequent applications early in the season and to reduce the proportion of lead arsenate because of possible injury to foliage.

CHERRIES

(1) Dormant. This is not necessary on sour cherries.	Scale insects.	Lime-sulphur solution, 6½-50 or other standard dormant spray.
(2) Just before blossoms open.	Curculio, Leaf Spot and Brown Rot.	Dehydrated copper sulphate dust (20%) with 10% lead arsenate.
(3) Just after petals drop.	Same as (2).	Same as (2).
(4) Ten days to 2 weeks after (3).	Same as (2).	Same as (2).
(5) Two weeks after (4).	Brown Rot and Leaf Spot.	Dehydrated copper sulphate dust (20%)—(without poison).
(6) Soon after fruit is harvested.	Leaf-spot.	Same as (5).

NOTE.—If conditions have been very favorable for brown rot development, application (5) can be profitably repeated about one week before harvest.

PLUMS

(1) Dormant.	Scale Insects.	Lime-sulphur solution, 6½-50, or other standard dormant spray.
(2) Just before blossoms open. This is the least important of all the applications.	Brown Rot and Curculio.	Dehydrated copper sulphate dust (20%) with 10% lead arsenate.
(3) Just after petals have dropped.	Brown Rot, and Curculio and Leaf-spot.	Same as (2).
(4) Two to 3 weeks after (3).	Same as (3).	Same as (2).
(5) About 1 month before harvest.	Brown Rot and Leaf-spot.	Dehydrated copper sulphate dust (20%). If curculio is prevalent at this time the poison should be added.
(6) One week to 10 days before harvest.	Brown Rot.	Sulphur dust or dehydrated copper sulphate dust.

(1) When shoots are 6-10 inches long.	Black Rot and Mildew.	Dehydrated copper sulphate dust (20%).
(2) Just before blossoms open.	Black Rot, Mildews, Berry-moth, and other chewing insects.	Dehydrated copper sulphate dust (20%) with 10% lead arsenate.
(3) Just after blooming period.	Same as (2).	Same as (2).
(4) Two weeks after (3).	Same as (2).	Same as (2).
(5) Ten days to 2 weeks, or just before the berries touch in the bunches.	Specially for Berry-moth, also for rot, etc.	Same as (2).

NOTE.—For Japanese varieties of plums, it will be safer to follow the summer schedule recommended for peaches.

GRAPES

(1) When shoots are 6-10 inches long.	Black Rot and Mildew.	Dehydrated copper sulphate dust (20%).
(2) Just before blossoms open.	Black Rot, Mildews, Berry-moth, and other chewing insects.	Dehydrated copper sulphate dust (20%) with 10% lead arsenate.
(3) Just after blooming period.	Same as (2).	Same as (2).
(4) Two weeks after (3).	Same as (2).	Same as (2).
(5) Ten days to 2 weeks, or just before the berries touch in the bunches.	Specially for Berry-moth, also for rot, etc.	Same as (2).

NOTE.—If leaf-hoppers are present, an application of nicotine dust should be made just before the oldest nymphs develop wings. This will probably come about the time of Application No. 4. If the nymphs continue to appear, as they probably will if weather conditions are favorable, the application of nicotine dust should be repeated in about 2 weeks.

Phoma Fruit Spot of Apples

by Charles Brooks

United States Department of Agriculture

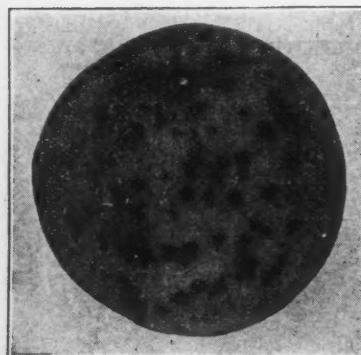


Fig. 1—Phoma fruit spot as seen at picking time.

Unfortunately the disease has acquired several different names. It was first studied in detail at the New Hampshire Experiment Station and the results reported under the title of "Fruit Spot of Apples." With later reports appearing on various other spot diseases of the apple, this name did not prove sufficiently distinctive and has sometimes been qualified as the "New Hampshire fruit spot." The disease has also been given the names "fruit speck" and "Brooks fruit spot." Probably the most satisfactory name is Phoma fruit spot, formed by prefixing the name of the genus to which the causal fungus has been assigned.

History and Distribution.

The origin of the disease is unknown. The first records of its occurrence come from New Jersey, and it is probable that its introduction in the country was made in that state. In 1892, Halsted reported the disease on quince in New Jersey, under the name of "quince blotch," but the first record of the disease comes from carefully painted Phoma fruit spots

on water color drawings of apples made by the daughters of William Coxe of Burlington, N. J. Coxe was the author of, "A View of the Cultivation of Fruit Trees of America," published in 1817, and planned to publish a second edition, to be illustrated with the colored drawings prepared by his daughters. The drawings were probably made about 1810 to 1828, so the disease must have been in the United States for a century. Phoma fruit spot was reported from Connecticut in 1905 and from New Hampshire in 1908 and is now known to be quite generally distributed over the eastern United States from Maine to North Carolina. It occurs in Michigan and in Canada and has been quite serious in Ohio and Arkansas.

Varieties Affected.

Phoma fruit spot occurs on practically all of the commercial varieties of apples, but is particularly serious on Jonathan, Baldwin and Tolman Sweet, and is quite common on Grimes Golden, Rome Beauty and Stayman Winesap. It occurs on a

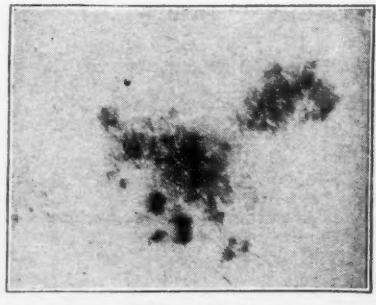


Fig. 2—A single Phoma fruit spot (magnified). The spot is the one indicated by the arrow in Fig. 1.

number of varieties of quince (*Cydonia vulgaris Pers.*) but the Orange quince seems to be particularly susceptible. The disease also occurs on the Chinese quince *Cydonia sinensis Thouin*. The spots on the apple and quince are similar in appearance and caused by the same fungus.

Appearance of the Disease.

The Phoma fruit spots are small, seldom having a diameter of more than three-sixteenths of an inch. *Continued on page 28.*

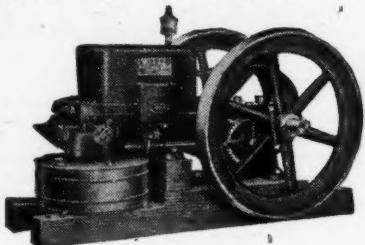
OUR PRESENT markets demand fruit that has a good appearance as well as good flavor and keeping quality. Some of the spots and defects that would once have passed unnoticed or as variety characteristics are now the cause of considerable concern. Among this class of diseases, the Phoma fruit spot of apples has attracted a great deal of attention the past season.

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Under Personal Direction P. V. LAND, Manager

Citrus Insects and Diseases in Flordia

by W. L. Floyd

University of Florida

THE MILD climate, abundant moisture and luxuriant vegetation make especially favorable conditions for the development of insect and fungous life. Fortunately the balance of nature is maintained here as well, or perhaps better, than elsewhere by one form preying on another. Nowhere else in the United States do the parasitic fungi develop and spread on insects that are troublesome in such number and variety.

The white fly has five known species of fungi thriving on its larvae, at least three of which are quite helpful in holding it in check in citrus groves. These are:

Red Fungus.

This fungus first shows itself as slight opaque, yellowish spots near the edge of the larvae. Delicate filaments grow into the soft tissues of the insects' bodies, absorbing the life juices. As the growth proceeds, these filaments spread over the larvae, completely enveloping them in densely interwoven disc-like cushions. Later there forms near the edges of each cushion small cavities in which bright red masses of spores develop. These yellow cushions with red spore masses set in them present a striking and characteristic appearance, hence the popular name "Red Fungus."

Yellow Fungus.

A fungus bearing yellow spore masses, but in other respects very similar to the red, growing on the cloudy winged white fly larvae. Just as some kinds of peaches or apples do better on clay and others on sandy soils, so here some kinds of fungi do better on one larval soil than another.

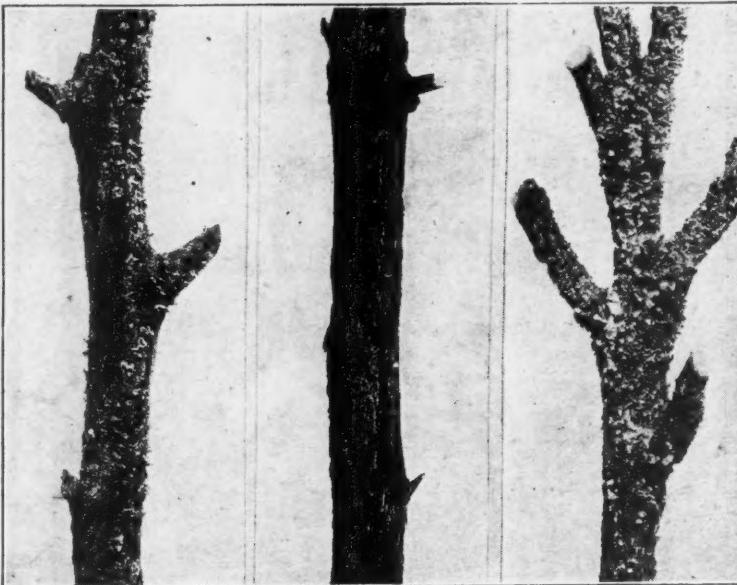
Brown Fungus.

The filaments of this are light brown in color, those entering the bodies of the larvae a much deeper brown; many filaments grow over the larval body, intertwine and finally form a compact seal brown membrane, not so much raised and cushion-like as that of the red and yellow fungus. This is called the "Brown Fungus." From the base of this membrane, colorless filaments reach out in all directions like runners from strawberry plants. When

a new larva is reached it is soon enveloped and destroyed. Some of these filaments are found two or three inches long, often reaching to the upper surface of the leaf.

For some years no fruiting bodies were found on this fungus. It was observed to spread from one part of

station, noted what appeared to be spores on the filaments on the upper side of the leaves. From these he succeeded in growing the characteristic fungus on white fly larvae. The reason for the long filaments reaching the top of the leaves was thus made plain. Conditions of light and air



Left—Red headed fungus on purple scale. Center—Black fungus on purple scale on grapefruit twig. Right—Gray headed fungus on purple scale attacking a twig.

a grove to another and it was thought probable that this was due to pieces of filaments being broken off and carried by the wind and by birds beginning growth anew, as natural cuttings from willows broken off and falling in the mud sometimes grow, and no doubt it is often spread in this way. In 1908, Prof. H. S. Fawcett, then of the Florida Experiment

were most favorable there for fruiting. Because of being on the opposite side of the leaf and having a different appearance from the brown membranes enveloping the larvae, it took a trained observer to associate the two and find these fruiting bodies.

Other less important fungi attacking white fly are White Fringe and Cinnamon.

Purple and long scale which rank next to white fly as serious citrus pests have three fungous parasites, while the Florida red scale has one, the pink, attacking it.

Red Headed Fungus.

A spore of this fungus floating in a drop of dew or rain is brought to the edge of the scale where it sprouts and sends its thread-like filaments into the soft tissue of the insect. These filaments branch and rebranch till a net-work is formed, then a bright orange-red knob-like growth breaks through the scale covering or develops at its base. These knobs are fruiting bodies bearing large numbers of spores. Their color and shape give the popular name Red Headed to the fungus.

Gray Headed Fungus.

This is more effective than the red-headed, which it resembles in most respects. The knob bearing the spores is white or gray and the spores are trident shaped. The arms of the tridents close on drying and open on becoming damp. This aids in their dissemination.

Black Fungus.

There is often found attached to the scale insects, especially those attacking twigs and fruit, a heavy black crust. In this spores are embedded. Sometimes the fruit are thought to be injuriously affected when only a pest is being destroyed.

Pink Fungus.

This attacks Florida Red Scale mainly, but sometimes also the Purple and Long. Its habits and method of spreading are much like the others. Japanese entomologists found and described it in Formosa about the time it was found here.

Mealy bugs, which are a serious pest in some other states, seldom increase in large numbers here because of the fungus Entomophthora formosa, recently found to be present on them in almost all localities.

Spreading in Groves.

Various methods of spreading these helpful fungi in infested groves have
(Continued on page 35.)

Spray Schedule for New England

By Fred Sears, Massachusetts Agricultural College

APPLE

Time of Application.	Materials Used.	Enemy.	Remarks.
(1) Delayed Dormant. Early spring as buds are breaking.	Lime-sulphur 6 gal. in 50, 40% nicotine sulphate $\frac{1}{2}$ pt.	Aphis, San Jose Scale, Blister mite.	This spray has very largely superseded the dormant application.
(2) Pre-Pink. Before the clusters of blossom buds separate.	Lime-sulphur 1 gal. in 50.	Apple Scab.	Used on McIntosh and other varieties especially subject to scab. Very effective.
(3) Blossom-Pink. As blossom buds begin to show pink.	Lime-sulphur 1 gal. in 50. Arsenate of lead paste 3 lbs. Powder 1½ lbs. Nicotine sulphate $\frac{1}{2}$ pint.	Red Bug, Scab, Curculio, Aphid, Tent Caterpillar, Bud Moth, Brown Tail Moth, Gypsy Moth, Canker Worm.	In areas where the gypsy moth is troublesome the amount of arsenate of lead is doubled.
(4) Calyx. When last of petals are failing.	Same as (3).	Coddling Moth, Scab, Curculio, Red Bug, Aphid, Gypsy Moth, Sooty-fungus.	Generally regarded as the most important single spray.
(5) 3 or 4 weeks after Calyx spray.	Same as calyx spray except no nicotine sulphate.	Same as calyx except Red Bug and Aphid.	

NOTES.

- Special Sprays.—The following special sprays are sometimes applied in addition to those listed above:
 - Where plum curculio is serious on apples a spray of arsenate of lead, usual strength, is applied a week or ten days after the calyx spray.
 - In seasons, or localities where sooty fungus is expected to be serious a spray of lime-sulphur, 1 gal. to 50, is made about two months after the calyx spray.
 - Bordeaux mixture is being used somewhat for the pre-pink and pink sprays on the theory that it is more effective than lime-sulphur. It does not appear to russet the fruit appreciably if used at these times.
 - Dustings were quite commonly used, instead of spraying, in parts of Maine in 1921, but has not been used to any extent in other parts of New England.

PEACH

Time of Application.	Materials Used.	Enemy.	Remarks.
(1) Dormant Spray applied either late autumn or early spring before buds begin to swell.	Lime-sulphur 6 gal. in 50.	San Jose Scale and Leaf Curl.	Autumn application is increasing.
(2) First summer spray just as the calyxes begin to fall from the small fruits.	Self-boiled lime-sulphur or atomic sulphur; 3 lbs. arsenate of lead paste of 1½ lbs. powder.	Curculio, Brown Rot, Scab.	If Aphis is present add $\frac{1}{2}$ pt. nicotine sulphate per 50 gal.
(3) Second summer spray applied 2 or 3 weeks after No. 2.	Same as No. 2.	Same as No. 2.	
(4) Third summer spray applied 2 or 3 weeks after No. 3.	Self-boiled lime-sulphur or atomic sulphur.	Brown Rot and Scab.	May be omitted on early ripening varieties.

PEAR

(1) Cluster Bud, as blossom buds separate in clusters.	Lime-sulphur 6 gal. in 50. Nicotine sulphate $\frac{1}{2}$ pt.	Scale, Scab, Blister Mite, Psylla (eggs and hibernating adults).	
(2) Calyx. Just after petals fall.	Lime-sulphur 1 gal. in 50 gal. Arsenate of lead 3 lbs. paste or 1½ lbs. powder. Nicotine sulphate $\frac{1}{2}$ pt.	Coddling Moth, Curculio, Scab.	Most important single spray.
(3) 4 or 5 weeks after calyx spray.	Same materials as calyx spray except nicotine sulphate.	Coddling Moth, Scab, other fungous diseases and leafing insects.	

NOTE.—Some growers are using an oil spray or winter strength lime-sulphur as a delayed dormant spray.

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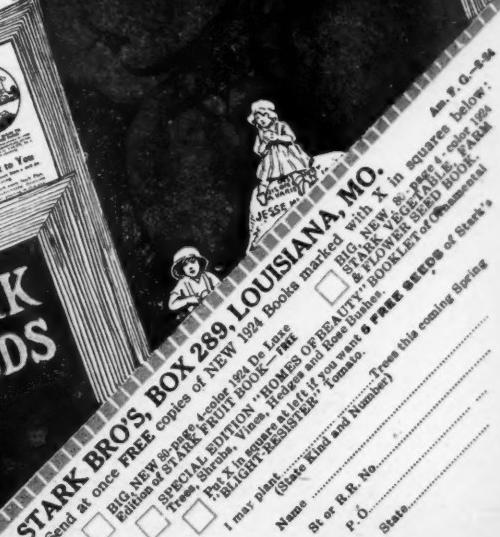


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Spray Calendars for Virginia

By G. S. Ralston, Virginia Polytechnic Institute

SPRAY CALENDAR FOR THE APPLE

Number and Name of Spray.	District.	Parasites.	Time of Application.	Materials to Use.	Remarks.
1. Delayed Dormant.	All districts.	Scale and aphid.	When green can first be seen in tips of blossom buds.	Standard strength lime-sulphur (see note No. 1) diluted 1 to 8 or its equivalent of other strength solutions. Add $\frac{1}{2}$ pt. Nicotine Sulphate to each 100 gal. of solution. If scale is found in any considerable amount, substitute Scalecid or the government lubricating oil emulsion for the lime-sulphur solution.	Every orchard should receive this spray. If scale infestation is severe, spray immediately with one of the oil sprays and then apply spray No. 1 at recommended time, using lime-sulphur and nicotine.
2. Pink Spray.	All districts.	Scab and mildew.	Begin when pink shows plainly in blossom buds.	Lime-sulphur, 5 qt. standard strength to 50 gal. of water.	Spray all varieties except York and Grimes, and if these varieties were infected at all in preceding year, give them this spray treatment.
3. Calyx Spray.	All districts.	Coddling moth, leaf roller, curculio, tent caterpillar, scab, mildew.	When petals are seven-eighths fallen.	Standard strength lime-sulphur, 5 qt. to 50 gal. water. To each 50 gal. of the solution add 1½ lbs. powdered lead arsenate.	This spray is very important as a means of controlling coddling moth and scab. The amount of lead arsenate has been increased to give better control of leaf roller.
4. Ten-Day Spray.	All districts.	Frog eye leaf spot, scab, mildew, blotch.	Ten days after the "Calyx Spray."	Same as in spray No. 2. If blotch has been prevalent substitute Bordeaux mixture 4-5-50 formula for the lime-sulphur.	The most effective frog eye leaf spot spray and very important for scab control. If the former disease is not prevalent, this spray might be omitted on York and Grimes, but it should be applied on scab susceptible varieties.
5. Four-Week Spray.	All districts.	Leaf roller, coddling moth, scab, bitter and black rots, blotch, cloud.	Apply four weeks after the "Calyx Spray." It is important that this spray be completed on the Pippins by June 5. Spray the Pippins first, then other varieties.	Bordeaux mixture 4-5-50 formula in district No. 1 and in Pippin or other rot susceptible orchards in all districts. Use Bordeaux 3-5-50 formula generally in districts 2 and 3. Add 1½ lbs. powdered lead arsenate to each 50 gal. of the mixture.	This spray is applied at the time the first brood coddling moth larvae are hatching. Without this spray, neither coddling moth nor bitter rot, in infected orchards, can be controlled. Bordeaux rather than lime-sulphur should be used since it is more effective and less dangerous to use.
6. Seven-Week Spray.	No. 1 and in rot susceptible orchards in 2 and 3.	Bitter and black rots, cloud, blotch.	Seven weeks after the "Calyx Spray."	Bordeaux mixture 4-5-50 formula.	Apply in Pippin and other rot susceptible orchards; also wherever rot, cloud or blotch was prevalent the preceding season.
7. Ten-Week Spray.	All districts.	Coddling moth, leaf roller, bitter and black rots, cloud.	Ten weeks after the "Calyx Spray" and 3 weeks after the "Seven Weeks Spray."	Bordeaux mixture 3-5-50 formula, except in Pippin or other rot susceptible orchards where the 4-5-50 formula Bordeaux should be used. Add 1½ lbs. powdered lead arsenate to each 50 gal. of mixture.	This spray is recommended just before the period when the coddling moth larvae of the second brood hatch in greatest numbers. It is also necessary for leaf roller control.
8. The August Spray.	All districts.	Leaf roller and coddling moth.	Probably Aug. 18 to 30. Exact date will be given through the Spray Service organization.	Lead arsenate, 6 lbs. powdered form to each 100 gal. of water. Add 20 lbs. lime to each 100 gal. of the mixture.	It is quite possible that this spray may not be necessary. The need will be determined by the field entomologists and the information will be sent out through the Spray Service channels to the growers.

Note No. 1—Standard strength lime-sulphur tests 32 degrees Baume.

District No. 1 includes Fairfax, Culpeper, Madison, Orange, Green, Albemarle, Nelson, Amherst, Bedford, Roanoke, Botetourt, Franklin, Patrick, Carroll and counties to the east. Recommendations for this district are applicable to the mountain districts of North Carolina.

District No. 2 includes the "Valley of Virginia," Loudoun, Fauquier, Rappahannock, Smythe, Pulaski, Washington counties and points below 1800 feet elevation in the Appalachian mountains. Recommendations for this district are applicable to adjoining districts in western Maryland and West Virginia.

SPRAY CALENDAR FOR PEACH

No. and Time of Application.	Materials to Use.	Parasites.
1. Dormant season (before buds have commenced to swell).	Standard strength lime-sulphur, diluted 1 to 8.	Scale, Leaf curl.
2. Immediately after the petals drop.	One pound powdered lead arsenate to 50 gal. water; add 3 lb. freshly slaked lime to each 50 gal. of solution.	Curculio.
3. One week after No. 2.	Self-boiled lime and sulphur; add 1 lb. powdered lead arsenate to each 50 gal. of solution.	Curculio, Scab, Brown rot.
4. Three weeks after No. 3.	Same as in No. 3.	Same as in No. 3.
5. One month before fruit ripens.	Self-boiled lime and sulphur.	Scab, Brown rot.
6. For late varieties only: three weeks after No. 5.	Same as in No. 5.	Brown rot.

The reader may note that spray schedule is arranged slightly different from that in last year's calendar. This is due to the need of earlier treatment for curculio, due to increased prevalence of wormy fruit.

If the peach orchard has suffered from early infection of brown rot, resulting in blighting of the blossoms and drying up and dropping of the small fruit, apply same treatment as in spray No. 3 when pink shows in the bud, and give similar treatment in spray No. 2 in place of treatment scheduled in above calendar. Generally speaking early infection of brown rot is not prevalent in Virginia and if found at all it probably will be in the eastern part of the state. Unless it is known to prevail, treat peach orchard as set down in tabulated schedule.

SPRAY CALENDAR FOR CHERRY

No. and Time of Application.	Materials to Use.	Parasites.
1. Dormant season.	Lime-sulphur, standard strength, diluted 1 to 8.	Scale and general clean-up.
2. Immediately after petals fall.	Standard strength lime-sulphur; Sour Cherry, diluted 6 qt. to 50 gal. Sweet Cherry, diluted 5 qt. to 50 gal. Add 1 lb. powdered lead arsenate to each 50 gal. of solution.	Leaf spot, Curculio.
3. One week after No. 2.	Same as in No. 2.	Leaf spot, Curculio.
4. Three weeks after No. 3.	Same as in No. 2.	Leaf spot, Curculio, Brown rot.
5. Immediately after fruit is harvested.	Same as in No. 2, but omit the lead arsenate.	Leaf spot.

The general prevalence of cherry leaf spot has made it advisable to give special calendar for the cherry, since the schedule recommended for peaches does not control the cherry leaf spot effectively.

SPRAY CALENDAR FOR PLUM

No. and Time of Application.	Materials to Use.	Parasites.
1. Dormant season.	Standard strength lime-sulphur, diluted 1 to 8.	Scale and general clean-up.
2. As soon as petals fall.	Standard strength lime-sulphur, 6 qt. to 50 gal. water; add 1 lb. powdered lead arsenate to each 50 gal. solution.	Curculio, Leaf spot.
3. One week after No. 2.	Same as in No. 2.	Curculio, Leaf spot.

(Continued from page 4.)

omitted on these earlier varieties. The fourth and last spray is applied four weeks before each variety is due to ripen. The time for this spray, therefore, depends on the ripening period.

Some Use a Late Dust Application. In order to increase the carrying quality and perhaps make the fruit

more resistant to brown rot infections, a few growers use a dust application of 80 per cent sulphur and 20 per cent lime seven to ten days before the fruit is ready to move (Fig. 3). A liquid spray could not be used so close to the ripening period on account of splotching the fruit; therefore, where this late treatment is desired a dusting

SPRAY CALENDAR FOR PLUM—Continued

No. and Time of Application.	Materials to Use.	Parasites.
4. Three weeks after No. 3.	Same as in No. 2.	Curculio, Leaf spot.
5. One month before fruit ripens.	Self-boiled lime and sulphur.	Brown rot and other fungous diseases.

SPRAY CALENDAR FOR RASPBERRY AND BLACKBERRY

No. and Time of Application.	Materials to Use.	Pest.
1. In spring before growth starts.	2½ gal. standard lime-sulphur in 50 gal. water.	Anthracnose.
2. When new shoots are 6 to 8 in. high.	5 qt. standard lime-sulphur in 50 gal. water.	Same.
3. Just before bloom opens.	Same as No. 2.	Same.

Remove badly diseased canes after fruiting season and burn.

SPRAY CALENDAR FOR GRAPE

No. and Time of Application.	Materials to Use.	Pest.
1. Dormant season.	Lime-sulphur, 32 degrees strength, diluted 1 to 8.	Scale and general clean-up.
2. When second or third leaf shows.	Bordeaux 4-5-50.	Anthracnose, Bitter rot, Black rot, Mildew.
3. Before blossoms open.	Same.	Same.
4. After blossoms fall.	Same.	Same.
5. Ten to 14 days later.	Same.	Same.

Then after at two week intervals until within two weeks of harvest time.

Lead arsenate, 2 lb. powder to each 50 gal. of solution, should be combined with Bordeaux if chewing insects make an appearance.

Burgundy mixture may be substituted for Bordeaux in the last spray in order to prevent discoloring of the fruit. The following formula is suggested:

Caustic soda..... 5 lb.
Copper sulphate..... 4 lb.
Water 50 gal.

Prepare and apply same as Bordeaux.

SPRAY CALENDAR FOR STRAWBERRY

No. and Time of Application.	Materials to Use.	Pest.
1. When growth begins.	Bordeaux mixture, 4-5-50 formula.	Leaf spot.
2. Before blossoming.	Same.	Same.
3. Just after blossoming.	Same.	Same.
4. After leaves have been mowed and burned.	Bordeaux mixture plus 1 lb. lead arsenate to each 50 gal. Bordeaux.	Leaf spot, Flea beetle.

Should leaf roller appear, or if it has been prevalent, add lead arsenate at rate recommended in No. 4 spray in each application.

Spraying the Georgia Peach Crop

(Continued from page 4.)

omitted on these earlier varieties. The fourth and last spray is applied four weeks before each variety is due to ripen. The time for this spray, therefore, depends on the ripening period.

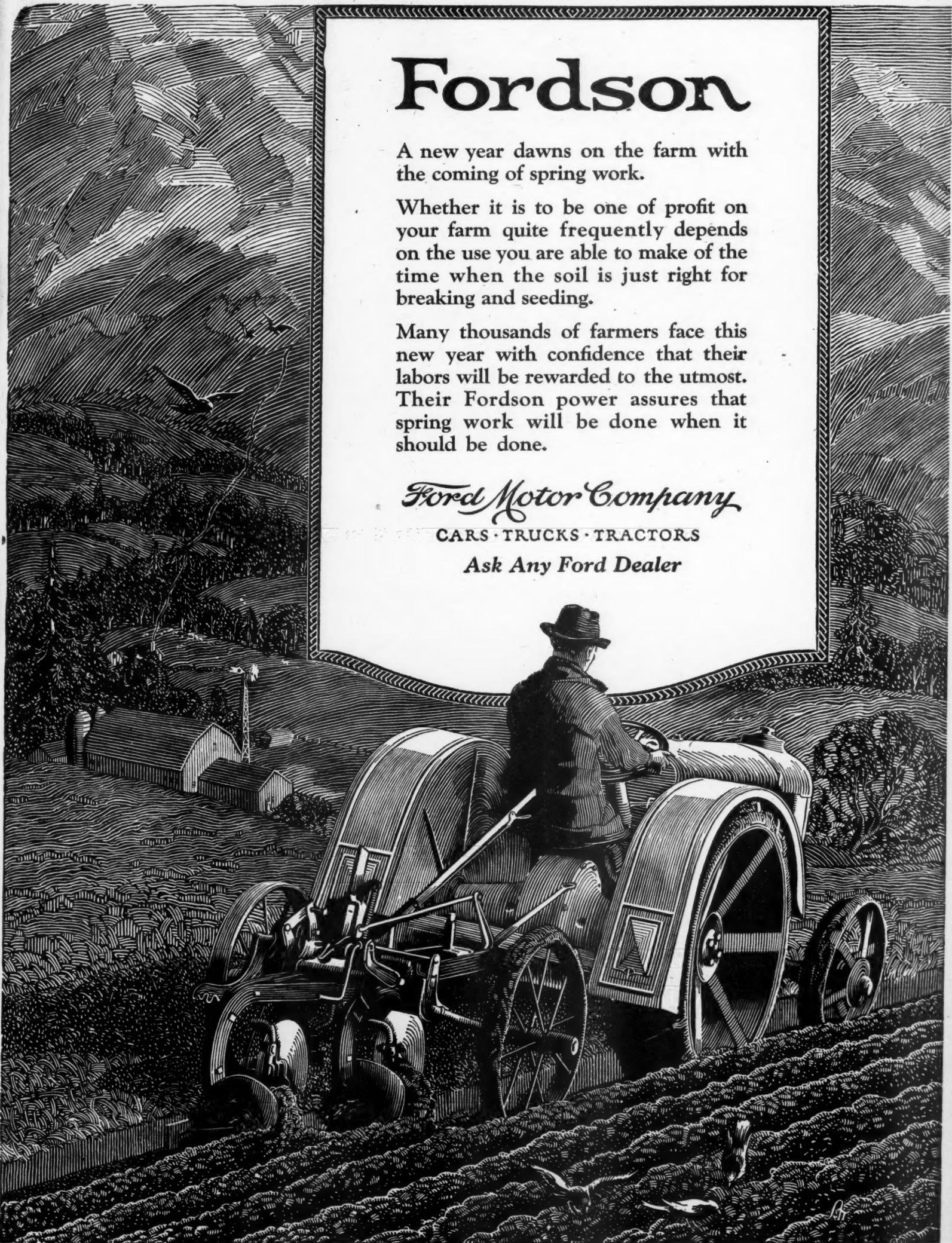
Some Use a Late Dust Application. In order to increase the carrying quality and perhaps make the fruit

more resistant to brown rot infections, a few growers use a dust application of 80 per cent sulphur and 20 per cent lime seven to ten days before the fruit is ready to move (Fig. 3). A liquid spray could not be used so close to the ripening period on account of splotching the fruit; therefore, where this late treatment is desired a dusting

machine is kept on hand for the purpose. The expediency of this practice is doubtful unless considerable rainfall proceeded the ripening period.

Brown Rot Usually Follows Curculio.

Brown rot is in many cases a secondary pest of the peach fruit in Georgia. The curculio paves the way for (Continued on page 20.)



Fordson

A new year dawns on the farm with the coming of spring work.

Whether it is to be one of profit on your farm quite frequently depends on the use you are able to make of the time when the soil is just right for breaking and seeding.

Many thousands of farmers face this new year with confidence that their labors will be rewarded to the utmost. Their Fordson power assures that spring work will be done when it should be done.

Ford Motor Company

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Ask Any Ford Dealer

Greatest Engine for All Work
The Cheat Mountain Orchards,
Rada, W. Va., May 25, 1923.
The New Way Motor Co., Lansing, Mich.

Gentlemen—We acknowledge with thanks receipt of booklet on New Way Engines. We have been using New Ways along with our crawler tractors, Dusters and Sprayers and assure you it is a real satisfaction to take a New Way-equipped rig out on our job.

Our work is all on steep mountain sides, quite a bit of which runs from 80 per cent to 40 per cent grades full of rocks and stumps. These are the conditions we have to work under not for an hour but day after day throughout our spraying season, with any number of 12 and 14 hour days at that.

Workmanship and material coupled with a design that bespeaks the alertness and effort of your engineers in producing the greatest engine for our work we have ever seen or handled. A properly set oil tight crank case, gravity feed fuel supply through an honest-to-goodness carburetor and except for a perfectly smooth fly-wheel there is not an unprotected moving part.

Yours very truly,
The Cheat Mountain Orchards,
E. E. Lontherman, Manager.

Here's What Your Own People Say

In orchard and field cultivation, the Air-cooled "New-Way" engine is supreme. It is standard power on the best sprayers and dusters, the best potato diggers, and the best small tractor on the market today. A "New-Way" Air-Cooled engine on your outfit will do your work the way you want it done.

Write for circular E for full specifications.

THE "NEW-WAY" MOTOR COMPANY
LANSING, MICHIGAN, U.S.A.

Eastern and Export Office: Woolworth Building, New York

Last Word In Engines

New Way Motor Company,
Lansing, Michigan.

Gentlemen—I have been foreman at the above for the past nine years and have had to do with quite some number of engines having about 1200 acres of orchard. Some time in 1917 we bought one of your engines which was not only used for spraying but for everything about the place.

This season we bought two of your 5 H. P. "New-Way" Air-Cooled Engines which I consider the last word in engines, being far superior to anything I ever used in rough ground and on hill sides.

Too much emphasis cannot be placed on the rough conditions under which these two engines worked on Hardie and other sprayers and at no time did they give one particle of trouble.

Yours truly,
John A. Sutphin, Foreman.

Spraying the Georgia Peach Crop

(Continued from page 18.)

brown rot infections by rupturing the skin for feeding, or egg laying, purposes. The disease readily enters the fruit through these punctures and sets up an infection. A heavy curculio infestation, therefore, facilitates the establishment of brown rot infection. Whenever the curculio is satisfactorily controlled in Georgia, there is little or no trouble from brown rot. The two applications of self-boiled lime-sulphur (Fig. 4) applied in the third and fourth sprays handle both brown rot and scab in a very satisfactory manner. However, if the curculio were not efficiently controlled the two fungicidal applications would often be insufficient for the control of brown rot.

Peaches Need No Spray During Stone Hardening Period.

Field observation and laboratory studies show conclusively that there is very little, if any, curculio activity during the stone hardening period of the peach. Egg deposition by the curculio ceases when the pit of the fruit begins to harden and does not start again until the fruit enters the ripening and swelling stage. There is also very little feeding on the fruit by the curculio while the pit is hardening. Applications of arsenate of lead during this period are of little value. Therefore, it will not pay to spray peaches from three or four weeks after the calyces or "shucks" have fallen until a month before the fruit ripens.

The ripening and swelling stage begins about one month before the fruit is ready to be harvested, and it is at this time that the curculio activity starts again in full force. It is during this period that the second curculio brood is so active in Hileys, Georgia Belles, and Elbertas in Georgia. By applying the fourth spray, consisting of arsenate of lead and self-boiled lime-sulphur, four weeks before each variety is due to ripen, the curculio activity during the ripening and swelling period of the fruit is halted.

Dusting vs. Spraying.

Some Georgia growers still use dust during the entire season and report good results from it. Many who were once supporters of the dusting method have forsaken it during the last three years for the liquid again on account of unsatisfactory results. Experiments in testing the two methods of peach pest control in Georgia show that the results from spraying and dusting are about the same when the curculio infestation and brown rot infection are not heavy; however, when these pests are particularly abundant, a better control is procured with the liquid spray. Those who dust in Georgia throughout the season usually use the 80 per cent sulphur, 5 per cent arsenate of lead and 15 per cent hydrated lime formula for all applica-

(Concluded on page 22.)

A Better Summer Spray

Sulfocide Does Not Russet or Drop the Fruit

SCIENTIFIC investigations show the finer the sulphur the greater the fungicidal action. Sulfocide, when sprayed, decomposes to an almost invisible film of true colloidal sulphur. Used on fruits and vegetables. Every one remarks on what high color and finish it produces. H. B. Fullerton, Director L. L. R. R. Exp. Sta., says: "We have absolutely wiped out peach leaf curl, we don't know

yellows, and we have staved off rot." E. R. Longenecker, Magnolia, Del., says: "We got 25c per basket above market price because of the wonderful color and absence of brown rot." Timmerman Bros., Fort Plain, N. Y., say: "We could not grow cucumbers without it, and find it great on all garden plants—a little goes so far." Send for free booklet, "A Better Summer Spray"—it helps growers.

B. G. PRATT CO.
DEPT. 11

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A Better Summer Spray

50 CHURCH ST.
NEW YORK



Fig. 5—Picking up peach "drops" in a Georgia commercial peach orchard for control of curculio.

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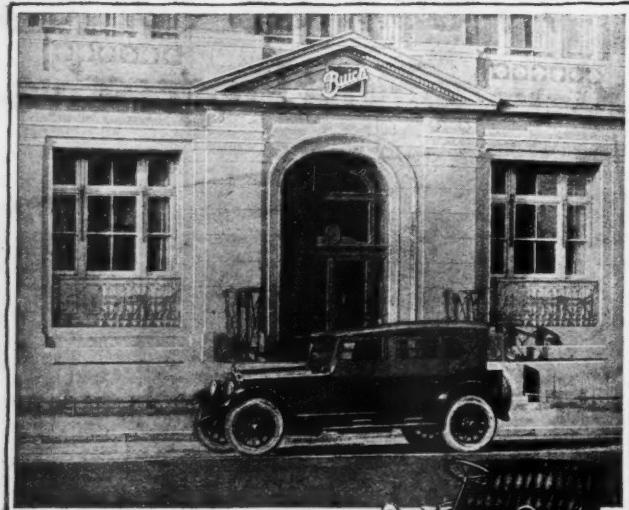
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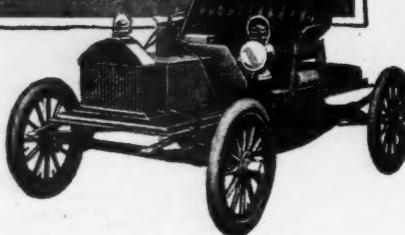
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General Motors cars and Delco-Light products may be purchased on the GMAC Deferred Payment Plan. Insurance service is furnished by General Exchange Corporation.

Spraying the Georgia Peach Crop

(Continued from page 20.)

tions. These applications are made as follows: First, immediately after the petals have fallen; second, when the calyces or "shucks" are shedding; third, two weeks after the second application; and fourth, four weeks before each variety is due to ripen. A few use a fifth application of dust, consisting of 80 per cent sulphur and 10 per cent hydrated lime, applied seven to ten days before harvest.

Supplementary Control Measures.

There are other control measures which most of the Georgia peach growers enforce in addition to the spraying program. The value of picking up peach "drops" was clearly demonstrated in 1921, when this practice so materially aided in correcting Georgia's abnormal curculio conditions. Now fully 95 per cent of the commercial peach growers in the state regularly pick up the peach "drops" each season (Fig. 5). They are sold to the practice and some say they would rather do without spraying than to have to suspend the practice of picking up "drops."

Most of the peaches that are "stung" by a curculio early in the season fall to the ground before and during the April drop. These infested drops furnish the adults, from whence come the destructive second brood of "worms." The frequent picking up and destruction of these drops prevents the maturity of thousands of adult beetles, and in this way the second curculio "crop" is materially reduced.

Disking under the spread of the trees during the pupation season of the curculio is another supplementary control measure that is often enforced in Georgia. It has been found that by breaking the soil cell while the curculio is in the helpless, delicate pupal stage, the heat and pressure of the soil soon causes the death of the insect. This work is usually done with an extension disk, which permits of stirring the soil well up under the trees where most of the pupation takes place.

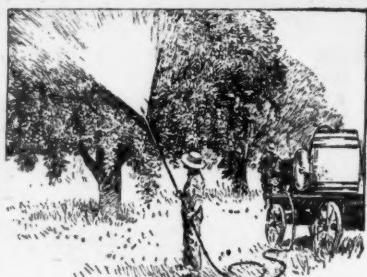
In orchards where the curculio has given considerable trouble, the surrounding woodlands, waste places, etc., are burned over during the following winter to destroy the adult beetles while they are in hibernation. Experiments have shown that the curculio infestation is usually much greater adjacent to a piece of woodlands which have been unmolested during the winter than it is adjacent to woodlands that have been burned over while the beetles are in hibernation.

Georgia's 1923 Peach Crop.

The quality of the peach crop in Georgia in 1923 was unquestionably the best since 1918. In 1919 and 1920 Georgia peach growers suffered severe losses from the curculio and brown rot. It has taken several years to bring pest conditions around to normal again. The program of work discussed in this article has turned the trick, and with the present information in hand, the Georgia growers feel that they are now better equipped to meet adverse peach pest conditions in the future.

The peach crop of the past season was also the second largest that has ever been produced in the state. A total of 8823 carloads were shipped during the season as compared with 7410 carloads in 1922 and 10,636 carloads in 1921. About 70 per cent of the 1923 crop was marketed f. o. b. the shipping point. There are now over 12,000,000 bearing and non-bearing peach trees in commercial orchards in Georgia, and a material increase in production is expected within the next few years.

BURN all the prunings of fruit trees, berry patches, etc. If possible, clean out rubbish in fence corners near the orchard and burn it. By so doing you will destroy many insects and large numbers of eggs.

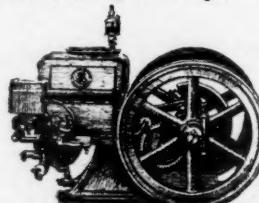


Spray thoroughly and harvest clean fruit

In hustling to spray your trees at just the right time, you can be thorough without being slow. Use a Hercules-powered sprayer and you'll get through quicker.

The Hercules engine puts thoroughness with speed in the job; pumps spray steadily for hours without rest, at 200 to 250 lbs. pressure. It is the same rugged and trouble-proof Hercules engine that is the standard farm engine of the world.

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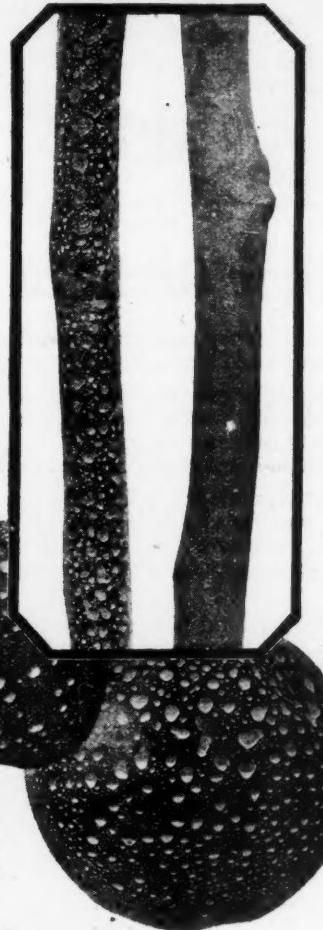
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200,000 Growers proved its worth last year



**APPLE BRANCHES
SPRAYED WITH
LIME SULFUR**

Note how the poison on the left hand twig (sprayed with Lime-Sulfur alone) merely spots the surface. Contrast the complete durable coating shown on the right hand twig where KAYSO was used with Lime-Sulfur.

Without KAYSO

The arsenate of lead on these apples collected in drops and dried in scattered spots, leaving plenty of space exposed to infection and worms.



With KAYSO

These apples were sprayed in exactly the same way with arsenate of lead and KAYSO. Note how the KAYSO provided an even, all-over protective coating—thus protecting the fruit from harm.

**SPREADS
the SPRAY and**



**MAKES
it STAY~**

Send for the Proof!

Investigate for yourself! See how this remarkable spray spreader and adhesive will provide a uniform, lasting coating of poison to protect your fruit. Mail the coupon for explanatory booklets. Or better still, send 40 cents for a sample package. Put KAYSO to an actual orchard test.

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New York Address: 175
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Check here and enclose 40c for
sample package of KAYSO—
enough for 200 gallons.

Check here for descriptive litera-
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spraying experts.

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PROVED IT—by scientific tests, yes!—but most of all by actual field use in thousands of orchards and gardens—under all sorts of climatic and weather conditions—on fruit, on vegetables, and on shade trees.

"I wouldn't waste another drop of spray solution without KAYSO mixed in it," wrote Otto Bender, of Jefferson Barracks, Mo.

Growers know that a spray without a good spreader deposits only a spotty, unstable covering which leaves much of the surface exposed, and often causes blotches that mar the appearance of the fruit or vegetables. Almost a quarter million farmers and orchardists have found out that KAYSO completely overcomes both these difficulties—and at a negligible cost.

Here's what some of your fellow-growers have to say about KAYSO.

E. Karst of Orlando, Fla., prescribes and takes his own prescription: "I am owner of a practical value on the two hundred acres last year that we intend to use it all the time when spraying our entire bearing peach orchards of four hundred and fifty acres, and will also use KAYSO in our summer sprays on our seven hundred acre apple orchards."

given to the man spraying, with no special instructions, and covered five full rows of thirty trees each. This considerable advantage was maintained during all the remaining sprays of the season."

Vegetable growers are also grateful to KAYSO. Mayim Brothers of Ocala, Fla., say: "We find it excellent as a spreader for Bordeaux Mixture on cucumbers."

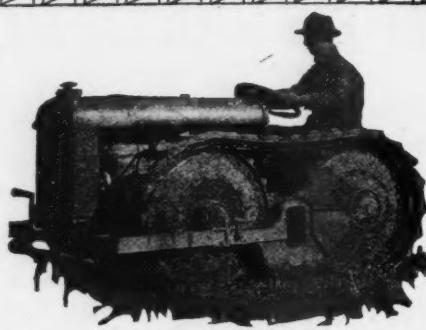
A. D. Smith, Jr., of Sanford, Fla., commends its use on another delicate product: "After an extended use of KAYSO in the spray on my celery fields I am more than satisfied with the results obtained."

J. H. Allen writes of the efficiency and economy of KAYSO: "Previous to my use of KAYSO I had a quantity of burned fruit. On the block of early Bell and Alberta peaches on which KAYSO was used last season this burning was entirely eliminated. I also noted in using KAYSO that it enabled me to cover more trees with my tank of material and it gave a uniform spread over the fruit. . . At the small cost of KAYSO, it practically doubles the value of the spray material."

How KAYSO gives greater coverage is shown by the experience of R. M. Hubbard, orchard manager for the South Jersey Fruit and Produce Farm: "The first tank of KAYSO dry mix that was applied fully convinced us of the ability of KAYSO as a spreader. Without the KAYSO in our tank it would not cover more than three and one-half rows of thirty trees each. The first tank containing KAYSO was

Speaking as an authoritative tree expert, F. A. Bartlett of Stamford, Conn., testifies: "We have used two hundred pounds of KAYSO this year for fruit and shade tree work and we have estimated that the time saved in spraying and efficiency of this work as a result of using KAYSO has saved us several hundred dollars. It has lessened the amount of arsenate of lead used at least twenty-five per cent and we believe the work was better done. Very little of the spray material dripped from the trees sprayed with KAYSO. This was not the case before we used KAYSO."

And so we could go on quoting scores of other successful growers, as well as Agricultural Schools, State Departments and entomologists. But prove it yourself—mixed with Lime-Sulfur, Bordeaux, Arsenate of Lead, and all other sprays. Send the coupon below, to our New York office, for a trial package—enough for 200 gallons of spray!



Fordson Power plus "Crawler" Traction

ONE of the prime essentials an orchard tractor should have is ability to work successfully in soft, loose ground—without losing traction through slippage, and without skidding of front end of tractor.

Another essential is ability to turn square at row ends without throwing strain on the differential.

The JOHNSON TRACKPULL gives the Fordson both of these qualifications to a greater degree than possessed by any other tractor, or by any other traction attachment for Fords. Increased traction—14 H.P. drawbar capacity—is obtained by full length "muley" type tracks having 1000 square inches of traction surface. Square turning without differential strain is secured by means of two independent clutches.

Get the full service of which your Fordson is capable by adapting it to your conditions with the JOHNSON TRACKPULL. Write for complete descriptive information, price, etc. And see your Ford dealer.

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are in greater demand than ever before and are selling at prices that yield attractive profits to growers.

Practical viticulturists have learned that liberal quantities of nitrogen must be supplied to produce the most abundant crops. Experiments have shown that

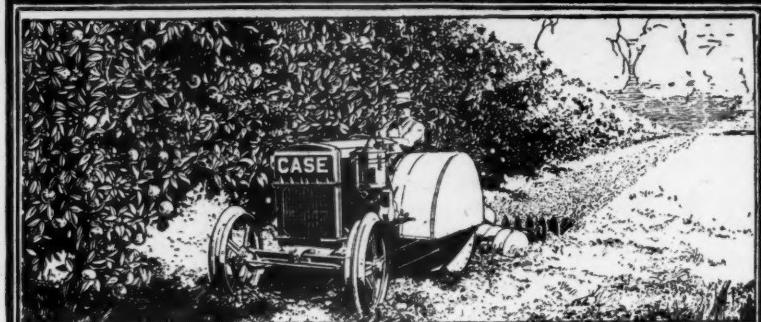
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200 Pounds Per Acre
Early in Spring

supplies the necessary nitrogen in immediately available form at just the right time. All small fruit crops are found to profit greatly from the use of Nitrate of Soda nitrogen. And it is now recognized that it is almost useless to attempt to grow orchard fruits profitably without Nitrate of Soda.

My free Bulletin Service issued periodically is full of the latest and most authentic information on the proper use of nitrogen in its best form for all crops. If you wish to receive these bulletins, send me your name and address and to identify this advertisement add the number 3642.

Dr. Wm. S. Myers, Director, CHILEAN NITRATE COMMITTEE
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A Case tractor makes it easy to keep your orchard in paying condition, well cultivated and clean, because:

The Case tractor is well adapted to orchard work.
It is easy to handle, even in crowded orchards.
It is consistent in performance.
It is dependable in every climate and season.

But Case tractor usefulness is not limited to orchard work. The same tractor can be used for all heavy farm work, traction and belt, for hauling, road work or custom work. A Case tractor increases a farmer's opportunities for profit in many ways, and for many years.

Progressive fruit growers and farmers everywhere are finding it profitable to use Case tractors with Grand Detour plows, orchard harrows and tractor disks. These machines have no superior for the kind of orchard and farm work that pays best.

Write for a new book, "Modern Tractor Farming," full of helpful hints for farmers of the higher types.

J. I. Case Threshing Machine Co.

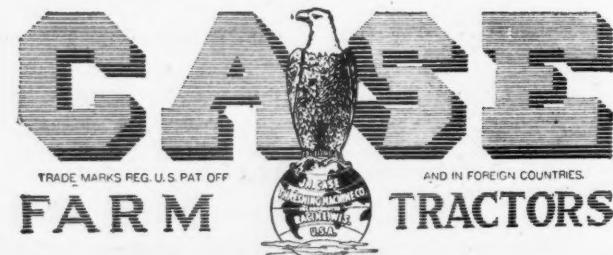
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RACINE

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NOTE—Our plows and Harrows are NOT the Case plows and harrows made by the J. I. Case Plow Works Company



Cherry Diseases and Their Control

(Continued from page 13.)

use Bordeaux and his neighbor will use lime-sulphur and each one is thoroughly convinced that the material he uses is the most satisfactory in every way.

There are several things to consider when deciding what material to use. Is it an effective fungicide, that is, will it control the diseases which attack the foliage and fruit? Will it injure the foliage? Will it have any undesirable effect on the fruit or foliage other than a direct spray injury?

Bordeaux mixture is undoubtedly an excellent fungicide but it also does some things that are not desirable. For instance, in many seasons, at least in some districts, it causes severe loss of leaves which is brought about by copper injury. There is also reason to believe that Bordeaux affects the fruit in a way which is not to the liking of the fruit growers.

Lime-sulphur solution has given excellent control of leaf-spot and brown-rot, even in seasons when conditions were most severe, and it is not likely to cause foliage injury. When all these things are considered, it seems that lime-sulphur should be given first place.

Spraying Schedule.
Cherry trees are seldom infested

with scale insects so that a dormant application is not necessary. They are occasionally found on trees of the sweet varieties and the trees should be sprayed when they are found, but sour cherry trees are practically immune. An application is sometimes made just before the blossoms open, but this is of doubtful value; and is not generally recommended. The spraying operations should begin soon after the blossoms fall and as here outlined.

First—Soon after the petals have dropped but not later than when the "shucks" have fallen from the small cherries.

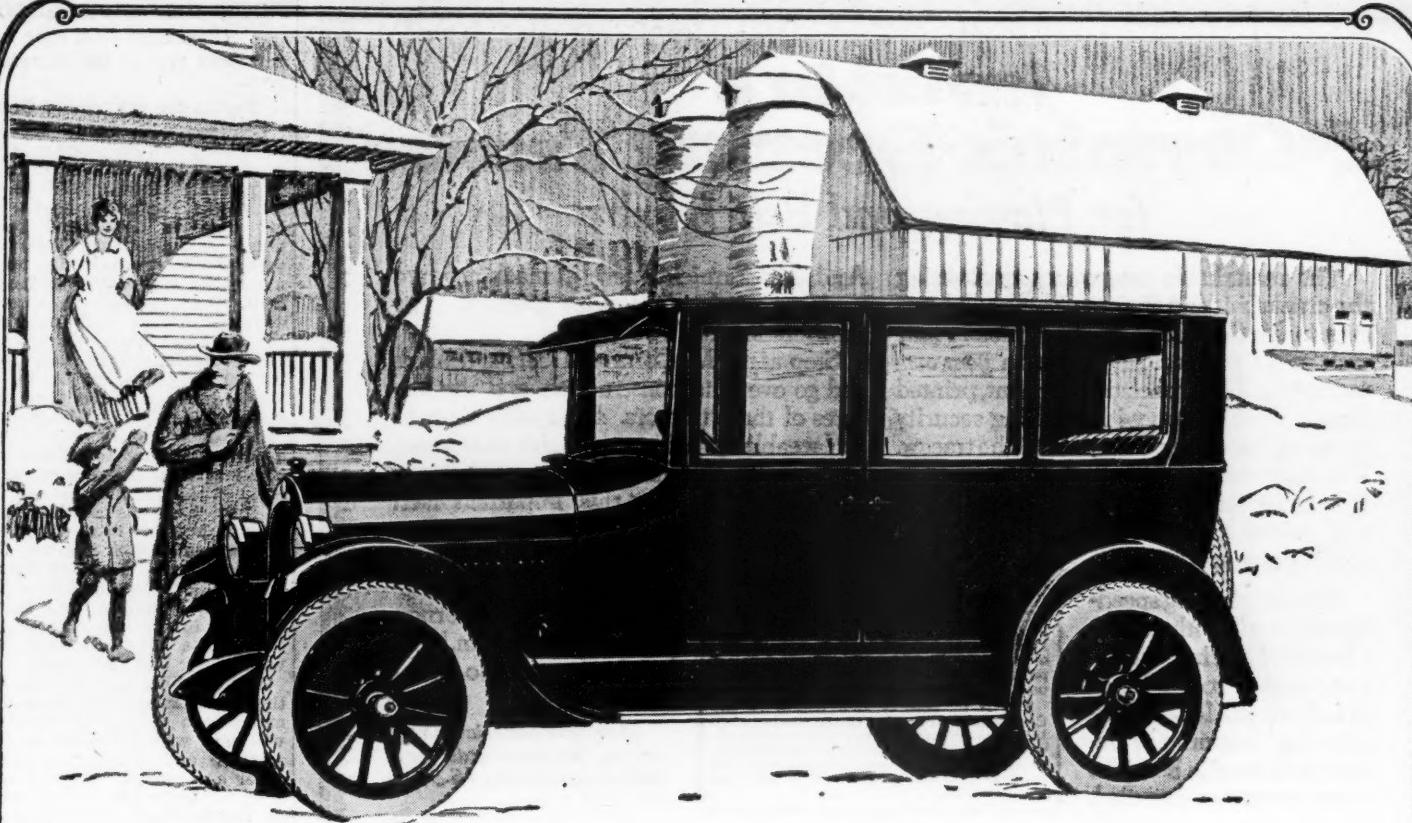
Second—Ten days to two weeks after the first application.

Third—Ten days to two weeks after the second application.

Fourth—Just after the cherries are harvested.

The number of applications recommended by experiment stations in various states may vary some from this, and as local men know their conditions best, it is advisable to follow their recommendations.

NO DOUBT you have found that the corners of your table oilcloth usually break long before the rest. You can prevent this breaking if you glue a piece of heavy muslin under the corners after you have fitted and before you have fastened the cloth to the table.



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Further, the seller agrees to replace free any Crankshaft Ball Bearing in the 10-20 or 15-30 McCormick-Deering tractor, which may break, wear out, or burn out during the life of the tractor, provided that the defective ball bearing is promptly returned to the factory or one of the branch houses.

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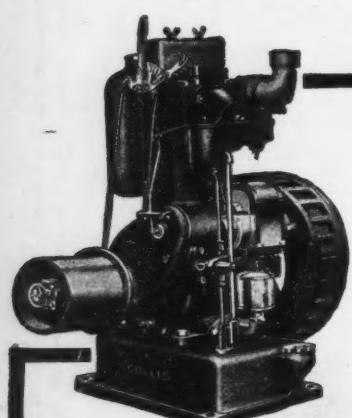
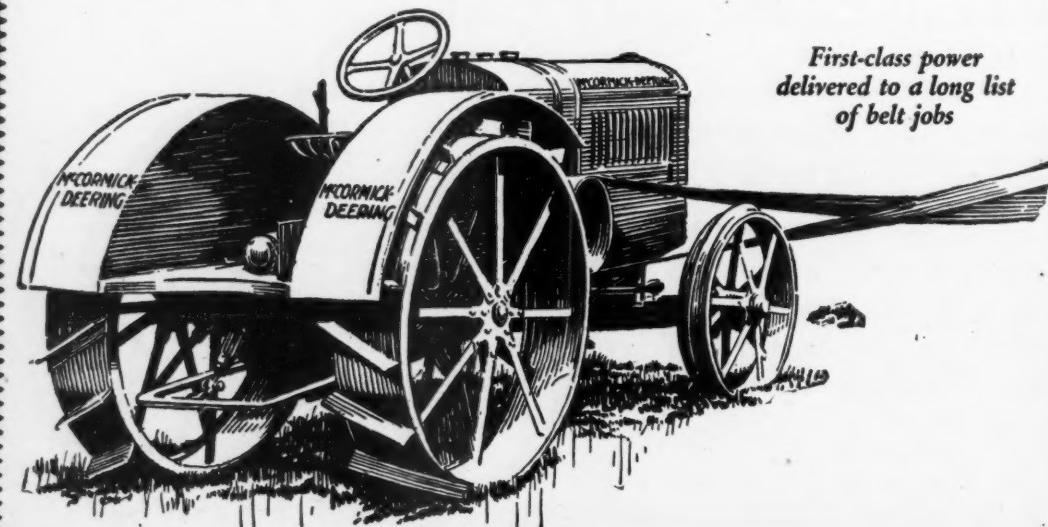
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All styles, 150 illustrations, secret of getting winter eggs, and copy of "The Full Egg Book," send 25 cents. INLAND POULTRY JOURNAL, Dept. 52, Indianapolis, Ind.

Notes on Spray Machinery

(Continued from page 12.)
important part of the spraying equipment.

Outfits for the Young Orchard.

Growers with 50 to 100 acres of young orchard are burdened with expense and have little relief in the way of returns. Paying \$300 to \$500 for a power sprayer looks like a big item to them, and because it takes comparatively little time to spray young trees, it ties up a lot of money for the few days the outfit is used. For growers so situated, the double-acting or tank pumps operating by hand have sometimes solved the problem. They may be placed in 100 to 200-gallon tanks, and the whole outfit may be mounted on a farm wagon. In one instance, two of these tank pumps took care of the spray needs in a 100-acre orchard for five years. It takes a sturdy, willing hand at the pump to furnish from one to one and one-fourth gallons per minute, but this rate will usually supply two small disk nozzles. This outfit costs from 75 to 120 dollars. On smaller acreages, barrel outfits costing 25 to 45 dollars may be used for the first few years. The limiting factor is the kind of labor available, with either style of outfit.

It should be pointed out here that the prices mentioned throughout this article are only approximate. They will vary with the make of outfit, the amount and quality of hose, and other accessories. Special equipment such as larger wheels and wider tires to lighten draft, and tanks of extra size also add to the purchase price.

Important Parts of a Spray Outfit. CYLINDERS.

The pumps on the majority of sprayers are of the force pump type, but there are one or two rotary pumps on the market also. These pumps may be driven by a belt, yoke, gear or chain, but the gear and chain drives are more commonly used. Belt drives were formerly more popular but belts wear out quickly and belt slippage results in the loss of power. Outfits are now constructed having one, two or three cylinder pumps. Four cylinder pumps have been added, but designers and manufacturers seem to favor three cylinder as sufficient for even large capacity work. Two and three cylinder pumps not only give greater nozzle capacity, but also more uniform pressure than the one cylinder outfit. Since it is the pump cylinder which comes in contact with spray material, it should be of special construction to withstand not only the wear due to friction, but that likely to occur from the corrosive action of spray materials. Brass, bronze and porcelain are non-corrosive and most pumps are so made that the cylinder consists merely of a brass tube, but one type is made of a cast iron sleeve lined on the inside with a brass cylinder. At least two manufacturers are now using a cast-iron cylinder lined on the inside with porcelain. Still another make of cylinder is constructed entirely of iron, but has a special packing, and since the wear comes entirely on the packing, which may be replaced, this cylinder is satisfactory.

PLUNGERS.

Growers should be interested in the pump plunger because the plunger that is so constructed that the packing can be easily tightened or removed is more desirable. The kind of packing used is really of less importance, since one-half dozen kinds are in use, all more or less satisfactory.

VALVES.

Several types of valves are used in pumps, depending upon the capacity and the pressure desired. The ball valve is the type most generally used on garden or orchard sprayers. It is cheap, simple, seats quickly and effectively, wears evenly and offers little resistance to the passage of liquids. Valves should be accessible enough in the outfit to be easily cleaned when clogged with twigs, leaves, gaskets (Continued on page 43.)

Orchard Problems and their Solution

by Paul C. Stark
Associate Editor

Protecting Trees From Rabbits

A number of my young trees have been girdled around the base of the trunk. Please tell me if these trees can be saved? —H. B. R., Missouri.

YOUR question is a timely one as it is during the winter months when mice and rabbits often damage trees. In the fall, all rubbish, grass and weeds should be removed from the base of the trees. It is also sometimes advisable to mound up the soil to a height of six inches about the trees.

This will help to prevent mice injury, but rabbits are more difficult to control. Tree protectors have been found to be the best method of controlling rabbit injury. They are made of galvanized wire cloth material, rolled to fit the tree and after placing around the tree they should be shoved into the soil two or three inches to make solid and to prevent mice from crawling under the protector.

These wire protectors will last many years and can be used on younger orchards later on. However, ordinary building paper or newspapers can be tied around the young tree for rabbit protection and is much cheaper but temporary. Any trees which have already been girdled by mice or rabbits can probably be saved by bridge grafting, which has been fully described in previous issues.

Training and Fertilizing Grapes

Should a smaller grapevine be given more or less fertilizer than a larger one? What systems of training are best for Catawba, Brighton, Diamond and Niagara—systems to give maximum production of grapes?—Kniffen or Chautauqua?—J. R. B., Pennsylvania.

IT IS generally true that a vine's capacity for utilizing plant food is based upon the amount of root system which it has. This in turn is closely related to the size of the vines. Thus we find that in general the larger applications of fertilizer should be given to the larger grapevines. If a vine is small because of its location in an area of poor soil, however, an extra addition of fertilizer, especially nitrate of soda, will do much to increase its growth in relation to the other vines.

There is no best system of training for grapevines. The Kniffen and Chautauqua systems are both commonly used, each being preferred to the other depending on the section of country. These two systems are alike in most respects in that approximately the same number of buds and canes are left in both instances, although trained in a slightly different manner. The number of buds and the general treatment of the vineyard has the greatest influence on fruit production.

Dehorning Peach Trees

Will dehorning 13-year-old peach trees which show unsound and discolored heartwood start new growth of any consequence? Is dehorning a good practice for old peach trees?—S. W. L., Ohio.

IF YOUR peach trees are in a fair condition of vigor and vitality, it would probably pay you to dehorn them even though some of the heartwood is unsound. All weak branches can be removed in pruning and the remaining branches will produce strong fruiting wood in one year's time. This will naturally be produced at points nearer the trunk of the tree where it will be more capable of supporting the weight of the fruit.

Dehorning is often a successful practice for peach trees when it will fail utterly in accomplishing the de-

sired results on apples and some other fruits. This is due to the fact that peaches are borne on vigorous one-year wood which is developed as a result of heavy pruning. If, however, the trees are in a very bad or weak condition, it would probably be a better plan to pull out the trees and set out a new orchard. Peach trees come into profitable bearing at a very early age and in a very few years equal the production of much older trees. The younger orchards are much more economically handled and more profitable than old orchards which are past their prime.

Origin of Stark's Golden Delicious

Can you tell me how the Golden Delicious apple was originated? Is it related at all to the Red Delicious?—I. W. K., Missouri.

THE ORIGIN of Stark's Golden Delicious apple is an intensely interesting story and yet very typical of the origin of practically all commercial varieties of apples. In other words, it is a so-called "chance seedling" and therefore nothing more than a tree which grew from the seed of an apple whose blossom was pollinated by chance.

The original Golden Delicious tree stands on a mountain side in the state of West Virginia, about 50 miles northeast of Charleston.

Golden Delicious is not related in any way to the Red Delicious, but because its shape and quality resemble the Red variety, it was named Golden Delicious. It is a late keeper and retains its rich quality in cold storage until late spring or summer.

Apple Scald

Please give description of scald. What causes scald on apples?—E. C. K., Indiana.

SCALD is a storage trouble caused by insufficient or improper ventilation in storage, in which the products of respiration are not carried off. These gases, when held in and around the fruit, result in a certain amount of breakdown in the fruit near the skin and cause discoloration.

Scald can usually be controlled by ventilation of the storage. In recent years, however, it is being satisfactorily controlled by the use of the oiled paper wrappers which are relatively inexpensive. The oil used in such wrappers absorbs the injurious gases and prevents scalding of fruit. Well-colored fruit does not scald as badly as poorly colored fruit. Some varieties scald and others are practically free of scald.

Apple Blotch in South

I am told that Apple Blotch is more prevalent in the southern states. Is this true?—E. S. B., Indiana.

THIS is undoubtedly true as in the south the growing season is longer and more rain causes conditions which favor the growth of this disease. Farther north it is of little importance. To control, all parts of twigs and limbs having cankers should be cut out. This disease is largely controlled by the same sprays used against apple scab, although sometimes it is necessary to make additional special applications.

In well sprayed orchards the blotch cankers on the twigs are not apt to develop. Some of the ordinary apples (for example, Duchess and Ben Davis) are quite susceptible to blotch and the disease should never be allowed to gain a foothold.

Spraying, As a Science, In Infancy, But Developing. Increase Your Profits By Keeping Informed

Spraying is a comparatively new science. Only a few years ago when San Jose Scale became prevalent, followed by other insects and diseases, some suspected that fruit growing for profit was at an end.

The result has been that we can thank these vexatious troubles for finer fruit and better orchards and more profit from fruit growing than ever before; not by the haphazard grower, but by those who keep abreast of the times and operate on a scientific basis.

The entomologists and pathologists have studied how to control insects and diseases, and chemists have cooperated in making scientific preparations to accomplish the most good, at minimum expense and labor.

The General Chemical Company, with offices at 40 Rector Street, New York, with branches in various cities, with plants and mines at different places in the United States and Canada, with an investment of millions of dollars, employing thousands of persons with special ability and training for the work, have for years been specializing in studying the problems of fruit and vegetable growers.

The latest development of this company includes Dritomic Sulphur, a highly concentrated sulphur in dry form. It dissolves readily, flows freely, covering large areas with little material and under lower pressure than sprays carrying large quantities of inert material, thus greatly lessening mechanical injury.

Dritomic Sulphur contains ninety per cent of especially prepared sulphur, with ten per cent of adhesive and spreader, which does not decompose and disappear quickly, although spreading in a thin film on fruit and foliage.

It is valuable in the prevention of russetting of fruit, when the temperature is above seventy degrees Fahrenheit, and it can be used with an arsenical, by the addition of lime, for insects.

Dritomic Sulphur has been tested on the tender foliage of young trees.

In one test on an orchard of three-year-old peach trees, the foliage became so dense that the fruit could scarcely be seen; the trees yielded an average of three baskets of fungus-free fruit per tree.

The work of the General Chemical Company chemists has shown conclusively that the value of dusts, is dependent upon the process of the manufacture of the sulphur in the dust, and as a result, a dust has been produced, shown by actual tests to be far more effective than mixtures of ground sulphur combined with an arsenical. This dust is called ASP, because it is primarily for apples, strawberries and peaches.

ASP Dust should be used on apples at the beginning of the calyx spray, continuing as needed, through the season.

On strawberries, it satisfactorily combats the weevil and leaf roller as well as brown rot, leaf spot, powdery mildew and leak. This application is followed with another special dust called Fungi Dust.

ASP Dust is for use on peaches for cercospora, scab and brown rot, also on plums and cherries, following with applications of Fungi Dust, which adds materially to the carrying quality of the fruit.

Other standard preparations of the Company include the well known BTS, one of the most remarkable and important combined insecticide and fungicide sprays, more effective and economical than lime-sulphur solution.

The Company also makes superior quality lime-sulphur solution, arsenate of lead, bordeaux powder, arsenite of zinc, calcium arsenate, atomic sulphur and various fish oil soaps.

Every fruit and vegetable grower should send for circulars of these various spray materials and dusts, which will be sent on application. If there are any special problems, help will be freely given. The circulars contain the most recent information regarding insecticides and fungicides and should enable growers to increase both their yields and profits.

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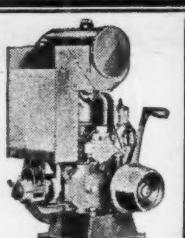
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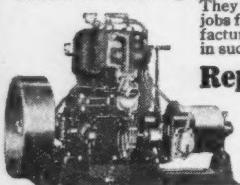
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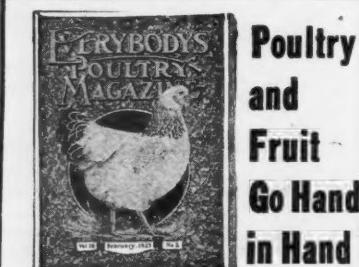
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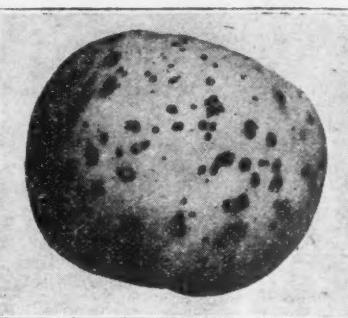
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Phoma Fruit Spot of Apples

(Continued from page 14.)

They are more highly colored than the surrounding skin of the apple, taking a deep red, or a black when on red or bluish areas of the fruit, and a dark green when on green or yellow fruit surfaces. The center of the spot is usually speckled or flecked with black, giving an appearance that does no occur on any other spot disease of the apple. If a very thin peel is removed, the flecked appearance is seen to still better advantage. Some of the minute black specks may have been removed with the peel but those that remain stand out in striking contrast with the white flesh of the apple and can be readily seen with the naked eye.

The Phoma fruit spots are rather irregular in outline and the ground color of the spots usually shades off gradually into that of the surrounding skin. The spots are shallow, usually affecting only the skin tissue and completely removed with a thick peel. The spot area is usually slightly depressed but has little or no collapsed or corky flesh be-



Phoma fruit spot after cellar storage.

neath. The spots are usually more abundant on the blossom half of the apple than on the stem half.

There are a number of other spots that have been confused with Phoma fruit spot, among which are Jonathan Spot and Bitter Pit or Baldwin Spot. Jonathan spots are more superficial than Phoma fruit spots, and, as found at picking time, are entirely removed by the thinnest possible peel. The spots are brown or black in color, circular in outline and one-sixteenth to one-eighth inch in diameter.

Bitter pit is characterized by the development of small brown spots or streaks in the flesh of the apple, most abundant just beneath the skin but sometimes spreading deep into the flesh. The disease is evident on the surface as sunken bruise-like spots that sometimes resemble the Phoma spots. The two diseases can always be distinguished by the fact that a moderately thick peel entirely removes the Phoma fruit spots but merely exposes the corky tissue beneath the bitter pit spots, making the disease all the more evident.

Development of Phoma Fruit Spot.

The description given above for Phoma fruit spot applies particularly to the disease as it is seen at picking time. The spots sometimes begin to show as early as the middle of August but are very faint at this time and usually overlooked. If the fruit is placed in cold storage immediately after picking, the spots usually make but little further development. They may sometimes become a little more sunken and develop a small amount of corky tissue beneath the skin, but the changes are not usually sufficient to make the disease of importance from the storage standpoint. If the apples are held in common storage, or are delayed in reaching cold storage, the results may be quite different. The spots that are evident at picking time may become more sunken and considerably enlarged and develop a distinct corky layer immediately beneath the skin; and numerous minute specks that are likely to be overlooked at picking time may

(Concluded on page 53.)

SPRAY

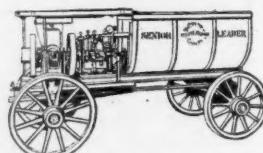
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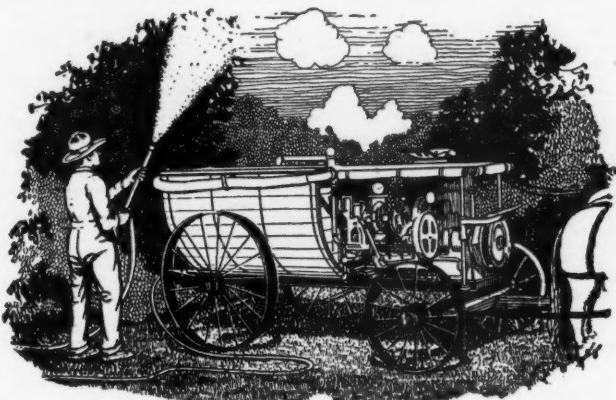
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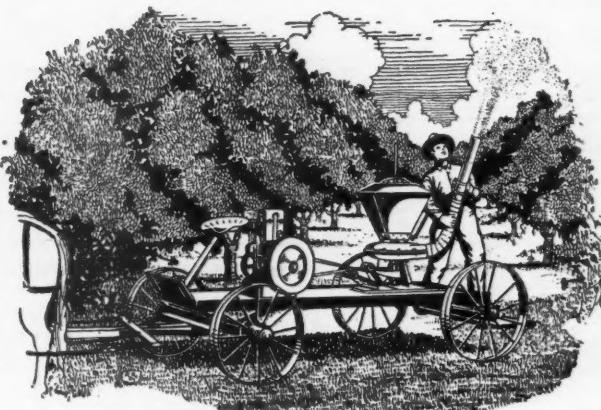
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Bean Giant Triplex Sprayer, capacity 12 gal. per minute



Bean 4 H. P. Duster for Orchard Work

"Bean" Power Sprayers

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There is no sense or saving in trying to get along with an inefficient rig or a makeshift outfit, when your trees demand something better. A first class, high grade sprayer is a real economy. It costs less in the end and it does faster, better work every day you have it on the job. If you haven't adequate spraying equipment you can add dollars to your income by securing a high grade modern Bean Sprayer.

Bean Built-In Dependability

Designed for highly effective work, rapid coverage, and utmost mechanical ruggedness, Bean Sprayers are making money and saving money for growers every spraying day of the year. Bean dependability is the built-in result of 40 years of experience.

The Bean Pressure Regulator saves fuel in the engine and wear and tear in the pump; and enables you to take out any valve in two minutes without stopping the engine, losing the pressure, or drawing the liquid from the pump. Bean Threadless Ball Valves can be flushed out in a jiffy and can never stick or give trouble. Bean Porcelained Cylinders give years of service without attention. The Bean Pump has no stuffing boxes, hence no stuffing box troubles.

Sizes to Meet All Requirements

Bean Power Sprayers are built in all sizes from the dependable little one-man Simplicity with a capacity of 5½ gallons a minute to the Bean Super-Giant with a capacity of 23 gallons a minute, every outfit thoroly guaranteed in every way.

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Established 1884
15 Hosmer Street
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Please send me your New Sprayer Catalog and Booklet of
"Better Spraying."
Name.....
Street.....
Town.....
State.....
Kind of Fruit.....
No. of acres.....
Soil.....

**BEAN
SPRAYERS**

BEAN SPRAY PUMP CO.
Established 1884
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SAN JOSE, CAL.

Sign and send the coupon
for full information on
the duster you desire.

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Established 1884
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Soil.....

**BEAN
DUSTERS**

15 Hosmer St., SAN LANSING, MICH.
Orchard Dusters
Name.....
Street.....
Town.....
State.....
No. of Acres
Soil.....

Where insecticides and fungicides are applied in their dry form, a Bean Power Duster affords the most effective means of doing the work.

Thoro Coverage Insures Results

The Bean delivers a dense all-enveloping cloud of dust which reaches every part of tree or plant. This is the result of perfect agitation, positive regulated feed, and uniform mixing of materials and air in the fan.

Dust Mixed in the Machine

This self-mixing feature is the greatest improvement in dusting machines since dusting was first introduced. Simply put the materials into the hopper, start the engine and in 2 or 3 minutes they are thoroly mixed. Then open the feed regulator and the dust passes thru the high speed fan and out thru the nozzle in a perfectly uniform flow. This cuts the cost of materials practically in half and insures added effectiveness of such materials as nico-dust which gives best results when applied moist and warm (a condition produced by the mixing process).

A quick and easy change of the feeder arm is made for sulphur and other dusts not requiring mixing.

Most Simple Outfits on the Market

Bean dusters have but one shaft and one belt. No gears, chains, or other mechanism to get out of order, or cause trouble of any kind. Simplicity means satisfaction.

Truck Dusters Orchard Dusters

Two-wheel type for truck crops and vineyard use; 4 wheel type for orchard work. The dusters are generally equipped with the dependable Bean 4 H. P. Bean Engine. They can also be furnished with 2 or 3 H. P. engines for lighter service. The Bean guarantee is an assurance of good service.

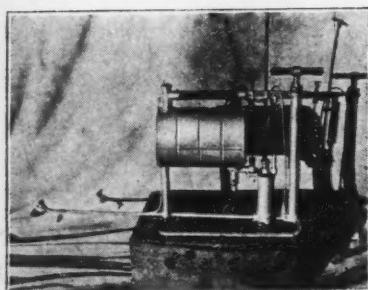
Spray Calendar for Florida Fruits

By W. L. Floyd, University of Florida

For Grapefruit and Satsumas				For Avocado			
Pest.	Time.	Remedy.	Remarks.	Pest.	Time.	Remedy.	Remarks.
Scab.	February or March, Just before growth starts.	Bordeaux-oil Mixture 3-3-50 Bordeaux, add concentrated oil emulsion to give 1 per cent of oil to the mixture.	Important in preventing scab on young growth.	Scab. (<i>Cladosporium Citri</i>).	March. (1) Latter part of blooming period. (2) Three weeks later. (3) Three or 4 weeks later.	3-3-50 Bordeaux Mixture.	Three sprayings are usually sufficient, though a fourth may sometimes be necessary.
For All Species of Citrus							
White Fly, Scale Insects, Rust mites.	May. When fruit is 1 in. in diameter.	Oil emulsion diluted to contain 1 part oil to 99 parts water, then add 2½ lbs. dry soda-sulphur to 100 gal.	Oil emulsion sometimes injures small fruit; it should be 1 in. or over in diameter to be safe.	Scale Insects. White Fly.	October. As foliage begins to harden. Repeat in December.	Oil emulsion, 1 to 70.	Alternate this with spraying for thrips, lace bugs and spiders, when they are present.
Rust mites, Red Spiders.	June. During dry weather.	Dust with Flowers of Sulphur, or spray with lime-sulphur, 1 gal. to 50 gal. water.	Watch for mites. Apply before they become numerous.	Leaf Thrips, Lace Bugs, Red Spiders.	November to March, when pests are found.	Lime-sulphur 1 to 60 plus 40 per cent nicotine sulphate 1 to 900.	Alternate with spraying for scale insects and white fly.
White Fly, Scale Insects.	Early in July. After rainy season begins.	Parasitic Fungi. Red Aschersonia. Red-headed fungus.	Dissolve spores off in water, strain and apply with a clean hand sprayer. If obtainable add spores of Brown, Gray-headed and Black fungi.	Flower Thrips, Blossom Anomala, Leaf Roller.	Early March when in bloom if pests are found.	40 per cent nicotine sulphate 13 oz. to 100 gal. water, then add fish oil soap 2 lbs., arsenate of lead, 3 lbs.	Unless thrips are numerous omit nicotine sulphate and soap.
White Fly, Scale Insects, Rust mites.	October or November.	Oil Emulsion in which soda-sulphur is dissolved.	Same proportions as given in second.	For Mango			
Special Spraying Not Usually Necessary Under Normal Conditions							
Scab.	Early February. Before new foliage unfolds.	Bordeaux-oil mixture	Same as first on Grapefruit and Satsumas where much scab is present. Important on young non-bearing trees. Prune out diseased parts as much as possible before spraying.	Anthraco nose (<i>Colletotrichum gloeosporioides</i>). Blossom Anomala.	March. When in bloom.	3-3-50 Bordeaux Mixture, 1½ lbs. arsenate of lead.	Repeat as often as necessary.
Thrips.	March. When about one-half the petals have fallen.	Nicotine sulphate with lime-sulphur. Use 13 oz. nicotine sulphate and 2½ gal. lime-sulphur to 100 gal. water. More often necessary on Satsumas.	Apply when 25 or more thrips are found to the blossom.	Red Spiders. Leaf Thrips.	November to March when pests are found.	Lime-Sulphur, 1 to 60 plus 40 per cent Nicotine sulphate, 1 to 900.	
Rust mites, Red Spiders.	August or September. When mites become noticeable.	Dust with flowers of sulphur, or spray with lime-sulphur 1 to 50.	Watch for mites if weather becomes dry. Apply before they become numerous.	Scale Insects.	December to February. When trees are dormant.	Oil emulsion, 1 to 70.	Alternate this spraying with one for Spiders and Thrips. Two or more sprayings may be necessary.
For Pineapple							
Soft Rot. (<i>Theilavlopis paradoxus</i> .)	Fruit after ripening.	Careful handling. Packing only when dry. Prompt shipment.	Sometimes severe among pineapples in transit.				
Red Wilt. (Caused by nematode.)	Six to 8 weeks before setting plants.	Breaking soil deep then applying calcium cyanamide, 1 ton to acre.	Too expensive for general use.				
Red Spiders. Mealy Bugs.	In periods of dry weather.	Handful of tobacco dust in bud of plant.					

Insect Pest Control in Southern California

by Hugh Knight
Citrus Experiment Station



Atomizing machine by means of which accurate dosages of hydrocyanic acid are delivered under the tent.

FUMIGATION with atomized liquid hydrocyanic acid is still the standard and most efficient method of control for scale pests of citrus trees in Southern California. And this, in spite of the fact that there are sections in which, for several seasons past, fumigation has yielded very unsatisfactory results.

Insects Becoming More Resistant to Gas.

The reason for this is not that the method itself is any less efficient than formerly; on the contrary it is considerably more so, but is due to the fact that the insects themselves are becoming more resistant to the gas. Two notable instances of this are to be found in the resistant red scale of the Corona section, and in the black scale of the Charter-Oak-Coyina section.

Resistance Occasioned in Three Ways

Resistance to the effects of hydrocyanic acid gas is occasioned in three ways. First—by a gradual process of natural selection over a long period (an apt illustration of the survival of the fittest). Second—by the state of the insect itself, with reference to its life history, at the time of fumigation. Third—by the effects of its environment, with special reference to low temperature.

We will consider briefly some of the factors bearing on this question.

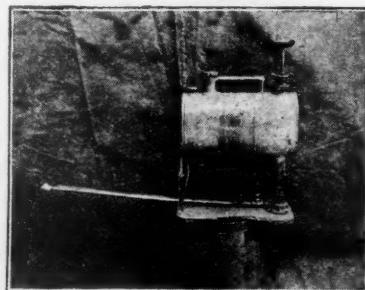
First—if it were possible to obtain a complete kill of scale, that is to say, eradication, resistance would be unheard of. In actual practice with present-day equipment this is not possible.

It is quite obvious that in order to kill insects by means of fumigation, they must be subjected to a certain

period of time, double the amount of hydrocyanic acid is used that would be required in the case of a gas-tight cover.

Factors Which Affect Gas Diffusion.

There are a number of ever-changing factors that affect gas diffusion both within and through the tent. A



Another type of atomizing machine.

maintain its concentration toward the lower part of the enclosed area (where the greater part of the scale are found); it is not quite as active as hot gas and consequently maintains a somewhat higher concentration and is therefore more efficient.

Diffusion of gas within the tent is not uniform, that is to say, the concentration varies very considerably in different parts of the tent. This in itself affects the kill of scale. Motionless air is a very rare thing. There is generally more or less air movement and while it may not be noticeable and may not be sufficient to flap the tent, it is still sufficient to affect gas diffusion in such manner that the higher concentration is maintained on the leeward side. It is a matter of common knowledge that more live scale are found on the windward side of the tree, and if any survive, that is the most likely place to find them.

Wherever the concentration of gas is not sufficient to kill all the scale, it is self-evident that the strongest and most resistant, those scale with the greatest vitality, will be the ones that survive, all the weak individuals being killed first. The next generation produced by these survivors are again subjected to the same process, etc. After a few years' time, it would be wonderful indeed if increased resistance to the gas did not become manifest. That this actually takes place is shown by the fact that red

(Continued from page 32.)



Making a determination of "kill" after fumigation in a lemon grove in Southern California.

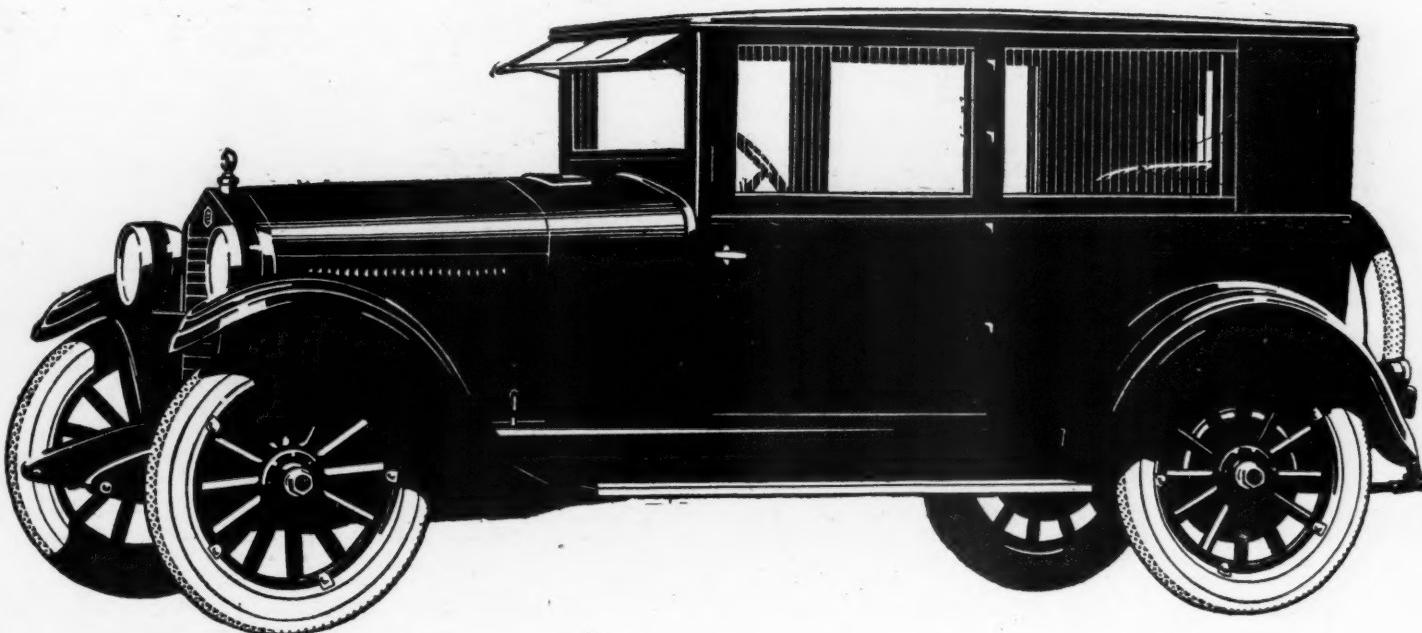
definite concentration of gas for a definite period of time. As a matter of fact, this is never accomplished in the field. The best of canvas covers have a very high leakage factor. In order to overcome the loss of gas through leakage and to maintain a killing concentration over the required

hot gas diffuses more rapidly than cold gas, not only within but also through the tent, thus increasing the leakage factor. It rises to the top of the tent and its greatest concentration is reached at that point. Cold gas, on the other hand, does not diffuse quite as rapidly; it tends to

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 Touring Model - \$850
Freight and Tax Extra

ESSEX MOTORS

DETROIT, MICHIGAN

Spraying Calendar for Rocky Mountain District

By M. C. Merrill, Brigham Young University

What to Spray For.	Treatment.	When to Spray.	What to Spray For.	Treatment.	When to Spray.
Codling Moth.	Arsenate of Lead 1-2 lbs. to 50 gal. water or 3 lbs. to 100 gal. water. For newly hatched insects make solution stronger; for old or large insects use double quantity.	(1) Spray immediately after petals have fallen. (2) Spray 10 days or 2 weeks later. (3) Spray one month later. (4) Spray later as necessary. Use powdered form of arsenate of lead.	Bud Moth.	Arsenate of lead. Same strength as for codling moth; later sprays stronger.	Just before the flower buds open.
San Jose Scale.	Lime-sulphur, 1 to 8, or miscible oil.	In dormant season as late as possible before buds open.	Apple Leaf Hopper.	Dip nursery stock in soap solution; spray with a tobacco solution on underside of leaves.	Early in season before winged stage appears.
Woolly Aphis.	Nicotine sulphate, 1 pt. to 100 gal. of water; or 15% kerosene emulsion; to either of these add 3 lbs. dissolved soap per 100 gal. Or paint affected parts with pure kerosene or crude petroleum. Some of these sprays may be added to the arsenate of lead sprays used for codling moth.	Any time when insects appear on the trees. Commonly done in fall after harvest but safer to do so earlier in season.	Thrips.	Nicotine. Repeat as needed.	Just as buds begin to unfold.
Oyster Shell Scale.	Concentrated tobacco solution, 2 pt. to 10 gal. of water; or 8% kerosene emulsion.	In the spring when the eggs are hatching.	Flea Beetle.	Spray affected nursery stock with arsenate of lead, 3 lbs. to 100 gal. water.	When insect appears.
Red Spider.	Clear cold water or concentrated tobacco solution, 2 pt. to 100 gal. of water; with either of these use 3 lbs. of dissolved soap per hundred gal. A mixture of lime-sulphur, casein and water may also be used.	Summer time when the spiders appear.	Apple Curculio.	Destroy hibernating places and cultivate the soil. Prune orchards and spray with arsenate of lead, 3 lbs. to 100 gal. of water.	When insect appears.
Pear or Cherry Slug.	Arsenate of lead, 3 lbs. to 100 gal. of water; white heliotrope, 1 oz. to 3 gal. of water; nicotine, 1 part to 500 parts of water.	In spring, or when insects first appear.	Plum Curculio.	Eliminate rubbish, destroy hibernating places and cultivate the soil; destroy fallen fruit. Spray with arsenate of lead, 3 lbs. to 100 gal. water.	When leaf buds are opening.
Tent Caterpillar.	Codling moth spray controls. Prune egg masses and burn, also burn the tent masses of the caterpillars.	In early spring as soon as found; or just before larvae begin damage.	Putnam's Scale.	Same as for San Jose scale.	Again after petals have fallen.
Fruit-tree Leaf Roller.	Miscible oil during dormant season to destroy egg masses; double strength codling moth spray just as buds are opening.	Miscible oil in early spring or any time during dormant season; arsenate of lead as buds are opening.	European Fruit-scale.	Lime-sulphur, 1 to 8.	Dormant season.
Fruit Tree Bark Beetle.	Keep trees in vigorous condition by cultural methods. Prune out dead limbs and burn.	Pruning best done in early spring.	Round-headed and Flat-headed Apple-tree Borers.	Cutting out with knife or wire, prevent egg laying on trunk by wrapping with paper, protect tree by painting trunk with pure white lead and linseed oil.	Before eggs laid in June and July, and upon appearance of insect.
Peach Tree-borer.	Old method: shield trunks with paper to prevent egg laying. Remove or kill borers with knife or wire. New method: Apply paradichlorobenzene to soil at base of trunk, one ounce to each tree. This treatment is recommended for trees 6 years or older.	Paradichlorobenzene treatment during dry weather in early September.	Fire Blight.	Cut out affected parts, removing cankered branches in dormant season and blighted branches as they appear in spring and summer. Sterilize wound and pruning tools with mercuric cyanide solution. Keep trees free from Red Spider and Aphis and plant resistant varieties.	As disease appears.
Peach Twig-borer.	Lime-sulphur, 1 to 9. Arsenate of lead, 3 lbs. to 100 gal. of water.	Just before buds open; just as leaf buds are opening, and later in the season just before peaches ripen.	Powdery Mildew.	Prune and burn affected parts. Lime-sulphur, 1 to 8. Bordeaux mixture.	As disease appears. In dormant season. In summer as necessary.
Buffalo Tree Hopper.	Clean cultivation; destroy weeds and burn pruned wood.	Pruning during early spring; cultivation during early summer.	California Peach Blight.	Prune and renovate orchard. Lime-sulphur, 1 to 8. Bordeaux mixture 5-5-50, or lime-sulphur 1 to 40.	In early spring. Dormant season. In summer as necessary.
Grasshoppers and Crickets.	Use spring tooth harrow on breeding ground. Sow broad sodium arsenite-bran mash where crops are being devoured. Made as follows: Bran (free of shorts), 100 lbs.; salt, 5 lbs.; amyl acetate, 3 oz.; sodium arsenite, 1/4 pt.; sugar beet refuse-molasses, 2 gal.; water, 8 gal. One to 3 oz. sodium arsenite used to 100 lbs. of bran. Mechanical traps also used.	Whenever they appear in numbers.	Peach Leaf Curl.	Lime-sulphur 1 to 8 or Bordeaux Mixture.	Before buds open.
Strawberry Leaf Roller.	Arsenate of lead, 3 lbs. to 100 gal. of water. Repeat this spray. Also cut leaves and burn.	Soon after adult moths appear. Ten days after first spray.	Apple Scab.	Copper sulphate, 4 lbs. to 45 gal. of water or Bordeaux Mixture once or twice.	Before fruit buds open.
Pear Leaf Blister Mite.	Lime-sulphur 1 to 8; miscible oils; concentrated tobacco solution; 20% kerosene emulsion.	Dormant season, or just as leaf buds are opening.			
Currant Fruit-fly.	Destroy or renovate neglected bushes; cultivate soil about plants; allow chickens access to currant patch to destroy wormy fruit and larvae.	As fruit develops.			
Green Apple-Aphis.	Prune infested twigs; tobacco solution, 2 pt. to 100 gal. of water.	Prune in early spring. After eggs hatch and before leaves begin to curl.			
Black Peach Aphids.	Dip nursery stock in strong tobacco solution; spray with concentrated tobacco solution; place tobacco solution or tobacco dust about exposed roots.	When insects first appear on twigs.			
Black Cherry-Aphis.	Prune off colony clusters; spray or dip as for black peach-aphis.	Same as for black peach-aphis.			
Strawberry Root Aphids.	Scatter straw over plants in early spring and burn. Destroy the ants which nurture the aphids by carbon bisulphide or poison syrup.	Early spring after eggs hatch and plant lice appear.			
Green Peach Aphids.	Tobacco solution, 2 pt. to 100 gal. of water.	Immediately after hatching and before insects migrate to other plants.			
Strawberry Crown Girdler.	Plow under old strawberry patches; rotate crops.	Fall or spring.			
Green Fruit Worm.	Codling moth spray.	When spraying is done for codling moth.			

Insect Pest Control in Southern California

(Continued from page 30.)

scale in different sections requires different dosages to effect a kill, or, when red scale from the different sections are all brought together and fumigated under identical conditions, those of the resistant strain always show a higher percentage coming through alive.

Moult Period.

Second.—The female scale, although having an incomplete metamorphosis and therefore not passing through any pupal stage, still goes through a moult period in which it casts its skin. During this period it becomes inactive or dormant. Now when an insect becomes inactive all the life processes slow up and while in this condition it becomes quite resistant to fumigation. Therefore the most re-

sistant scale of the resistant strains are those passing through the moult.

Third.—Exposure to low temperature for an appreciable length of time causes the insect to become dormant; inactivity results with consequent resistance to fumigation.

Conditions being as they are, it is small wonder that the growers in localities where results from fumigation prove unsatisfactory are turning their attention to spraying. It is not probable that spraying will ever take the place of fumigation even in those sections, but it may be used as supplementary or rather accessory thereto. It is not humanly possible to hit every scale on a heavy foliated citrus tree by means of a spray, and no contact spray will kill what it does not hit. Furthermore, the chances of injury to the fruit and the tree when spray material is used of sufficient strength to kill scale, are very great, and for this reason spraying of citrus trees for control of scale has been discour-

aged. The spray most commonly in use at the present time is a lime-sulphur miscible oil combination—two per cent lime-sulphur, three-fourths to one and one-half per cent miscible oil.

Neutral Miscible Oil Spray Tried Out.

During the past year a neutral miscible oil spray has been quite extensively tried out. This spray, as far as the writer is aware, has caused no injury whatever even when used as high as 10 per cent, unless a slight dropping of the leaves some time after the application can be attributed to it. At strengths above five per cent, it appears to be quite an effective ovicide and for that reason gives promise of usefulness against the red spider, as well as scale, especially in the coastal sections where lime sulphur is ineffective against the former.

An innovation in the fumigation procedure has been brought about the past season by the use of calcium

cyanide dust. This has been applied under the tent by means of a power blower specially adapted to this purpose. The generation and diffusion of hydrocyanic acid gas by this method, and also the scale kill, have been quite satisfactory, but severe injury to the fruit and tree have resulted wherever moist atmospheric conditions have been encountered. The use of this new insecticide for the present, will be restricted to the dry interior sections such as the San Joaquin, Coachella and Imperial valleys. However, its use is not confined to the fumigation of citrus trees; it gives promise of successful employment against the grape leaf hopper, false chinch bug and other insects.

The grape leaf hopper succumbs readily to the gas given off and falls to the ground. The insect will revive in a short while unless the soil under the vines is given a thorough coating of dust.

(Concluded on page 36.)

Timeliness In Apple Scab Control

by G. H. Coons

Michigan Agricultural College

OF ALL the plant disease problems which confront the fruit grower, the control of apple scab is probably paramount. But interest in scab and scab control waxes and wanes—some years apple scab is the center of discussion and some years its consideration is taboo. A year ago at a large convention of



Fig. 1—Apple scab on fruit.

apple men, control of scab was the theme of many a session. The past year it has hardly been mentioned. The reason for the rise and fall of interest has been the relative presence and absence of the trouble. The 1922 year was a "scab" year and experienced growers fell woefully short of control. The year 1923 was not a scab year and growers have banished scab from their thoughts. Unfortunately, apple scab has not been banished from our orchards. And interest in this disease should not trail along, as

a post-mortem on our failures to control the disease, but should be alive and active until growers everywhere intelligently put in practice the abundant information which we now have about this wasteful disease which year in and year out reduces fine fruit to seconds and culls, to say nothing of the wasting effect it has upon the set of fruit and upon leaf efficiency. In short, because apple scab during the past season did relatively small damage in the northeastern fruit section, growers should not beguile themselves into feeling a false security against this parasitic disease. Apple scab is still with us and still is a matter of utmost concern to the grower who would produce quality apples.

Of all the diseases that could be chosen, apple scab is probably best known to the growers in certain of its phases. In other phases it isn't known at all. Yet intelligent control of such a parasite hinges upon a grower's ability to detect the disease in all its ramifications and to utilize the information which the experiment stations through the press give to growers. When the editor of the American Fruit Grower Magazine asked me to write an article on this disease and its control, I welcomed the opportunity to bring before the fruit men who study its pages the fundamental facts about this parasite, which a grower must have in order to control efficiently and thoroughly this blemishing disease.

Scab Must Be Known When Seen.

In the first place, it is necessary to know apple scab when you see it. As I have said, scab on the fruit is well known (Fig. 1). Scab on the leaves

is not so well known. Long experience with growers in the field has shown me that the majority do not know the effect scab produces in its primary stages of attack—the leaf phase. Apple scab on the leaves shows up as a sooty growth on either the upper surface or lower surface of the leaf (Fig. 2). The spot is not so black as is typical for the fruit stage, but is rather a black mold, occupying a circular area from an eighth to a quarter of an inch in diameter. Sometimes the scab is so severe as to blacken the entire under surface of a leaf. With susceptible varieties, the leaves may be puckered or humped at the scab spot. Other susceptible varieties may have dead areas about the spots, but in all cases the telltale sooty growth is present. With some varieties of apple, the scab attacks the twigs, making small dead patches on the bark, much as if small bits of tissue had been scratched up with the finger nail. Fortunately such attacks are rare, the Lady apple being the only one showing such a condition commonly. With pear scab—a sister parasitic disease—the twig scabbing is common and this is what makes pear scab so hard to control.

Then there are the attacks of scab on the pedicels of the young, rapidly expanding fruit. Certain authorities state that in some seasons apple scab is largely responsible for the so-called June drop. At any rate, examination of the fallen fruit reveals scab cankers on the fruit pedicels, which penetrate deeply enough to account for the fall of the fruit.

Winter Fruiting Stage Most Important.

Then there is the winter fruiting

stage of the fungus which inaugurates the disease during the new season. It is a safe proposition that no practical grower knows this stage which is most important in influencing the amount of scab during the season



Fig. 2—Apple scab on leaf.

which is to follow. This is produced on the fallen leaves which lie scattered here and there beneath the trees—some partly buried, some in contact with the ground and some blowing about here and there. Examine a leaf at random next spring and on both

(Continued on page 44.)

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OUR spray pumps are built in capacities to fit every job, and every pocket book as well—from the small hand sprayer for hedges and rose bushes to the 30 gallon per minute power sprayer for the largest fruit farm.

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There is no use in tying up capital in a spray outfit that is really larger than needed, nor is there any economy in



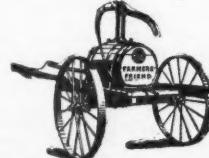
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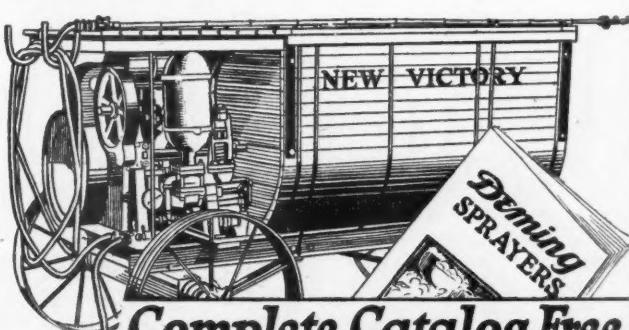
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Spray Calendar for Pennsylvania.

By F. N. Fagan, Pennsylvania State College

APPLES

Time.	Materials for 200 Gallons of Spray.	For Following Diseases and Insects.
TREES DORMANT or DELAYED DORMANT.	Lime-sulphur testing out of sprayer 1.03 Sp. Gr.	San Jose Scale.
Leaves of first buds showing about $\frac{1}{4}$ in.	Lime-sulphur testing out of sprayer 1.03 Sp. Gr.	San Jose, Oyster or Scurfy Scales.
Pink. When flower cluster buds are separating.	Lime-sulphur testing out of sprayer 1.008 Sp. Gr.	Aphis. Bud moth. Leaf-rollers and other eating insects.
Petal Fall. When petals have nearly all fallen from flowers.	Lime-sulphur testing 1.008 Sp. Gr.	Scab, Frog-eye, Mildew. Aphis. Red Bug if not under control.
Two weeks after Petal Fall spray. Apples well formed.	Substitute Bordeaux Mixture for Lime-sulphur in sections where Apple Blotch and Bitter Rot are pests.	Coddling moth. Curculio and any other eating insects.
*Extra Spray. For use in sections infested with Apple Blotch and Bitter Rot.	Bordeaux Mixture, 16-16-200. (If eating insects are not under control use 6 lbs. powder arsenate of lead.)	Apple Scab, Frog-eye, Apple Blotch. Coddling Moth, Maggot, Aphis, Red Bug.
Four weeks after Petal Fall spray.	(If Aphis not under control use nicotine in this spray same as in Petal Fall spray.)	*Blotch and Bitter rot.
Mid-Summer Spray. Late July or early August, depending upon season. Time it for second brood coddling moth.	Repeat Petal Fall spray. Nicotine not necessary unless aphids are not under control.	Coddling moth.
In sections where Lime-sulphur solution burns foliage and fruit Self-boiled Lime-sulphur can be substituted.	Substitute Bordeaux Mixture for Lime-sulphur in sections where Blotch and Bitter Rot are pests.	Late infection scab—Fruit spot—Sooty and Fly speck fungus—Bitter rot. Coddling moth and other eating insects.

CHERRIES

DORMANT.	Materials for 200 Gallons of Spray.	For Following Diseases and Insects.
	Lime-sulphur to test 1.03 Sp. Gr. out of sprayer.	San Jose, Forbes, Putman scales.
*Extra spray. When first new leaves show aphids present.	Miscible oil sprays as recommended by the manufacturer.	Lecanium and related scales.
Petal Fall. After petals have fallen.	Tobacco Extract (40 per cent nicotine) 1 qt. and 4 to 6 lbs. of soap in solution.	Aphis.
When calyx shucks are off the green fruit.	Self-boiled Lime-sulphur 32-32-200.	Brown rot, Leaf Spot, Mildew. Curculio.
*Just before fruit turns color.	Powder arsenate of lead 6 lbs.	Brown rot, Leaf Spot, Mildew. Curculio.
Late summer foliage spray.	Self-boiled Lime-sulphur.	Brown rot, Leaf Spot, Mildew. Fruit fly, early slugs.
After fruit is harvested.	Powder arsenate of lead, 6 lbs.	Leaf Spot.
*This spray may often be omitted.		Cherry Leaf slug.

GRAPES

When new shoots are 6 to 14 ins. long.	Bordeaux Mixture, 16-16-200.	Mildew. Anthracnose. Black Rot. Flea beetles—early Rose chafer and Berry moth.
Before flower buds open, but after flower bud clusters are well formed.	Powder arsenate of lead 6 lbs.*	Mildews. Anthracnose. Black Rot. Flea beetles, Root worm, Rose chafer, Berry moth.
Just after flower buds have bloomed and young fruit has set.	Bordeaux Mixture, 16-16-200.	Mildews. Roots. Any eating insects.
Ten days to 2 weeks later.	Powder arsenate of lead 6 lbs.	Rots.
Two weeks later.	Bordeaux Mixture, 16-16-200.	Mildews.
	(If eating insects not under control add powder arsenate of lead 6 lbs.)	
	(If leaf hopper nymphs are present add 1 qt. of 40 per cent Nicotine.)	

*Special Leaf Hopper Spray—This insect often becomes a serious pest. It can be controlled by spraying when the boppers are in the nymph stage by using 1 qt. of 40 per cent nicotine in combination with the above sprays, or by special sprays using the nicotine with 4 to 6 lbs. of soap in solution.

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Maloney's
FRUIT and ORNAMENTAL TREES
For Both Home and Commercial Planting

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PEACHES

Time.	Materials for 200 Gallons of Spray.	For Following Diseases and Insects.
DORMANT.	Lime-sulphur to test 1.03 Sp. Gr. out of sprayer.	San Jose Scale. Peach Leaf Curl.
*Special DORMANT. For lecanium and related scale insects.	Miscible oil such as "Scalecide." Strength as recommended by the manufacturer.	Lecanium and related scale insects.
When little peaches are pushing out of calyx shucks.	*Self-boiled Lime-sulphur, 32-32-200.	Peach scab. Brown Rot.
Three weeks later.	Powder arsenate of lead 6 lbs.	Curculio.
Three to four weeks before fruit ripens.	Repeat last spray.	Peach Scab. Brown Rot.
	Self-boiled lime-sulphur, 32-32-200.	Brown Rot

Time.	Materials for 200 Gallons of Spray.	For Following Diseases and Insects.
DORMANT.	Lime-sulphur testing 1.03 Sp. Gr.	San Jose Scale.
Pink or Flower bud.	Lime-sulphur to test 1.008 Sp. Gr.	Scab, Leaf Spot, Black Spot, Black Rot.
When flower buds separate in cluster.	Tobacco extract (40 per cent Nicotine) 1 qt. Powder arsenate of lead 6 lbs.	Paylila, Aphis. Any eating insects.
Petal Fall.	Lime-sulphur to test 1.008 Sp. Gr.	Scab, Leaf Spot, Black Spot, Black Rot.
After petals have fallen.	Tobacco extract (40 per cent Nicotine) 1 qt. Powder arsenate of lead 6 lbs.	Paylila, Aphis. Coddling Moth, early slugs.
Fruit Cluster spray about 2 weeks after petal fall. When young fruits stand in open cluster.	Lime-sulphur to test 1.008 Sp. Gr.	Scab, Leaf Spot, Black Spot, Black Rot.
	Powder arsenate of lead 6 lbs.	Coddling Moth, slugs.

PEARS

Special Sprays Needed to Fight Pear Paylila. Nicotine 1 qt. to 200 gal. and 4 to 6 lbs. of soap in summer months to kill nymphs. Miscible oil sprays as recommended by manufacturers on warm days in late winter will aid by killing adults.

DORMANT.	Materials for 200 Gallons of Spray.	For Following Diseases and Insects.
	Lime-sulphur testing 1.03 Sp. Gr.	San Jose Scale.
	Lime-sulphur to test 1.008 Sp. Gr.	Scab, Leaf Spot, Black Spot, Black Rot.
	Tobacco extract (40 per cent Nicotine) 1 qt. Powder arsenate of lead 6 lbs.	Paylila, Aphis. Any eating insects.
	Lime-sulphur to test 1.008 Sp. Gr.	Scab, Leaf Spot, Black Spot, Black Rot.
	Tobacco extract (40 per cent Nicotine) 1 qt. Powder arsenate of lead 6 lbs.	Paylila, Aphis. Coddling Moth, early slugs.
	Lime-sulphur to test 1.008 Sp. Gr.	Scab, Leaf Spot, Black Spot, Black Rot.
	Powder arsenate of lead 6 lbs.	Coddling Moth, slugs.

PLUMS

Special Sprays Needed to Fight Pear Paylila. Nicotine 1 qt. to 200 gal. and 4 to 6 lbs. of soap in summer months to kill nymphs. Miscible oil sprays as recommended by manufacturers on warm days in late winter will aid by killing adults.

DORMANT.	Materials for 200 Gallons of Spray.	For Following Diseases and Insects.
	Lime-sulphur to test 1.03 Sp. Gr. out of sprayer.	San Jose Scale.
	Miscible oil sprays as recommended by the manufacturer.	Lecanium and related scales.
	Self-boiled Lime-sulphur, 32-32-200.	Brown Rot, Leaf Spot, Mildew. Curculio.
	Powder arsenate of lead 6 lbs.	Leaf Spot, Brown Rot, Mildew. Curculio.

SPRAY CALENDAR

1. To secure the specific gravity of lime-sulphur as recommended in this calendar, test the concentrated lime-sulphur solution with a specific gravity hydrometer. Divide the decimal part of the concentrate reading by the decimal of the desired spray. The result shows the total dilution required. Example, concentrate testing 1.27 sp. gr. and desired spray is 1.03 sp. gr., dividing .27 by .03 gives 9. Nine is the total dilution required; thus one would use 1 gal. of a concentrate testing 1.27 sp. gr. and 9 gal. of water to get a spray testing 1.03 sp. gr.
2. Know what pests you are trying to control.
3. Know you are using the right materials, applying them at the right time and doing a complete job of spraying.
4. Be sure your sprayer engine has power enough to give you good pressure. Two hundred and fifty pounds is not too much pressure if using spray gun, more will do no harm.
5. If using spray gun, do not shoot direct with the solid spray.
6. In making Bordeaux Mixture, have both the lime solution and the copper sulphate solution in their full dilutions before mixing them. Place one solution in sprayer, start the engine and then add the other solution.
7. In making self-boiled lime and sulphur, slack lime slowly, when partly slackened add sulphur, allow to heat until brown streaks appear slightly and then stop cooking by adding rest of cold water.

NOTE BY MANAGING EDITOR—This calendar is of special interest to growers in New York, New Jersey, Michigan and Pennsylvania.

30 VARIETIES STRAWBERRY PLANTS CHAMPION EVERBEARING STRAWBERRY plants \$10.00 per 1000 strong well rooted plants. GIBSON, PEARL, WM. COOPER, EAGON, RUE, SPECIAL, etc. are certain to bear you a bumper crop. SAWYER, MICH.

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	Keith's new-land plants are certainly the best you can buy and they are guaranteed to grow in good growing condition. We ship them well packed, direct from our Nursery. We supply you with a free copy of Keith's Ways to Successful Berry Culture with your first order. We have a splendid stock of Keith's Everbearing strawberry plants, as well as the well-known standard varieties, also grapes, raspberries, blackberries and other small fruits, all illustrated and plainly described in our handsome new catalog which is now ready for you. It is full of valuable information illustrating growing fields and fruits.
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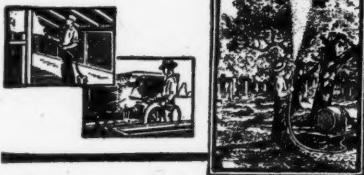
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from NURSERY to YOU

Citrus Insects and Diseases

(Continued from page 16.)

been tried. An early and still often used one in small areas is to gather leaves or twigs having fungi on them and fasten these close against leaves or twigs of infested trees. The most used means now is to soak leaves well covered with fungi in a fruiting condition in water, stirring well so that spores and pieces of filaments



Red-headed fungus on purple scale attacking citrus leaf.

may be washed off, then spraying this water into the trees. The best time for doing this is during the rainy season, and a mixture of two or more kinds is desirable.

Keeping in Cold Storage.

The fungi are usually gathered from the trees when needed, but if large quantities are wanted it is sometimes difficult to find, for when most of the larvae are killed or when the weather is dry much of it dies. It has been found that leaves with the attached fungus may be gathered in autumn and kept in cold storage till the time for spraying comes again. They may be dried and kept also, though the spores do not always retain their vitality when treated this way.

Growing on Sweet Potatoes.

The Red Fungus grows well, under proper conditions, on sweet potatoes. One who has but a small amount may, by starting six or eight weeks before the fungus is needed, grow a good supply by cutting potatoes, putting pieces in large mouthed bottles, sterilizing them, and then inoculating with fungal spores and keeping them at an even favorable temperature till development is complete.

A number of men make a business of spraying on fungi during the summer. One man during a recent season sprayed 100,000 trees, or approximately 1400 acres. Several others sprayed 15,000 to 25,000 trees. Altogether, within the past few years, over 2,000,000 trees have been treated each year.

It is not wise to trust entirely to the working of the fungous friends to keep their host insects in subjection. Oil emulsion sprays from the lubricating oils first came into general use in Florida on white fly and scale insects. These are still much used and when properly applied are very efficient. Recently there has come into use a combination of these with Bordeaux mixture, which is proving of much value. Its development came about as a result of a need for a preparation that would be both fungicide and an insecticide. When Bordeaux is applied to control a fungous disease, it destroys the beneficial fungi as

(Continued on page 42.)

Buy tires as you buy livestock

All horses have four legs. All tires are made up of rubber and layers of cotton cord or fabric.

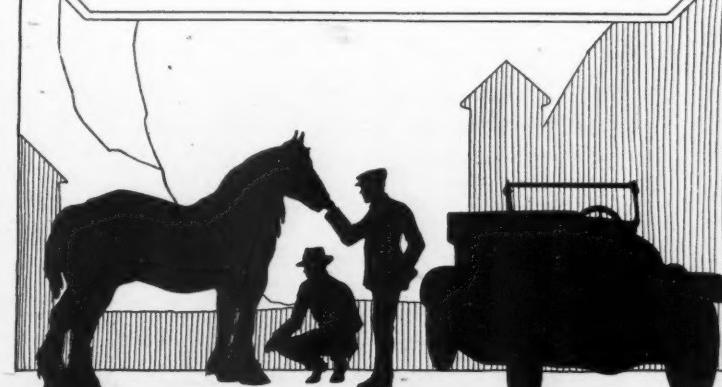
But all horses are not equally valuable—and neither are all tires.

A horse of good blood and breeding is naturally worth more than a "plug." If you were offered your choice at the same price there isn't any doubt which one you would take.

Why not buy tires with the same sound judgment?

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KELLY SPRINGFIELD TIRES

Spray Calendar for Southern California

By Hugh Knight, Citrus Experiment Station

The important diseases and pests that affect commercially grown trees

APPLES

What to Spray For.	Treatment.	When to Spray.	Remarks.
Coddling Moth.	6 lb. dry basic arsenate of lead to 200 gal.	(1) When most of petals have fallen. (2) Just after blossoms fall. (3) 8 to 10 weeks later.	Thoroughness is the essence of coddling moth spraying.
Woolly Aphis, Green Aphis, Peach Aphis.	Nicotine sulphate and liquid whale oil soap or miscible oil.	As soon as aphids appear in spring.	
San Jose Scale.	Lime sulphur 10-12 gal. to 100 gal. or 2% lubricating oil emulsion.	Dormant season.	
Apple Scab.	Bordeaux.	As soon as cluster buds open.	
Powdery Mildew.	Lime-sulphur sol. or atomic sulphur.	In spring.	Combine with (2) Coddling Moth spray.

PEACHES

What to Spray For.	Treatment.	When to Spray.	Remarks.
Scales—Black and Brown.	Miscible oil or crude oil emulsion.	Dormant season.	Not generally severe on peaches.
Peach Leaf Curl, Twig Borer.	Lime-sulphur sol.	When buds commence to swell.	Dormant spray for blight may be enough.
Calif. Peach Blight.	Bordeaux.	Dormant season.	

PEARS

Thrips.	Nicotine.	As the blossom buds are opening.	
Red Spider (mites).	Lime-sulphur sol. or atomic sulphur.	When mites appear.	Often dormant oil spray will control mites.
Coddling Moth.	See under "Apple."		
Pear Blight.	Spraying not effective.		

PRUNES

Brown Apricot Scale.	Miscible oil or crude oil emulsion.	Dormant season.	
Mealy Plum Louse.	Nicotine.	Just after petals have fallen.	The oil spray for scale may control aphids if applied just after harvest or just before blossoming.
Red Spider (mites).	Lime-sulphur dust, lime sulphur solution or atomic sulphur.	Whenever mites appear.	

WALNUTS

Coddling Moth.	Spray 4 lbs. dry basic arsenate of lead to 100 gal., or dust with 15 per cent arsenate lead dust.	May 25 to June 20. When hatch is well underway.	When both coddling moth and aphids are present, add 1 pt. nicotine.
Aphis (when codding moth is not present).	Nico-dust.	May or June.	
Red Spider (mites).	Flowers of sulphur and hydrated lime 3 to 1.	When mites appear.	

SMALL FRUITS

Mildew.	Flowers of sulphur dust.	Early in spring.	
Strawberry Leaf Spot.	Bordeaux.	Just before or just after blossoming.	
Aphis.	Nicotine.	Whenever they appear.	
Red Spider (mites).	Sulphur.	Whenever they appear.	

Peach twig borers attack many of the deciduous trees occasionally. Special spraying for them is seldom practiced. Dormant oil spraying seems to be beneficial in their control.

California peach tree borer may be controlled by use of paradichlorobenzene applied to soil during warm weather.

There is a tortrix worm that occasionally does some damage to oranges, but special control measures are not employed.

Woolly aphids attack both apples and pears, and occasionally other deciduous trees. The aerial forms may be controlled as are other aphids, but the root forms are much more difficult to combat. There is no proven economical method of control on old trees.

Strength of Materials to Use

Nicotin—1 pint to 200-gal. tank. Three gallons of liquid soap is an aid as a spreader.

Miscible Oil—Several proprietary preparations for which the formulas vary.

Crude Oil Emulsion—

Crude oil (21-24)	25 gal.
Liquid soap	3 gal.
Water	.175 gal.

Bordeaux—	
For fall or dormant deciduous spraying, 5-5-50 or Bordeaux powder, 18-20 lbs. to 200-gal. tank.	
For spring deciduous or any citrus spraying, 2-2-50 or Bordeaux powder 8-12 lbs. to 200-gal. tank.	
Lime Sulphur Solution—	
20 gal. to 200 gal. tank for all purposes listed except on citrus during warm weather, reduce to 6 gal. Casein has proven a very efficient spreader. Use at rate of 1½ lbs. to tank (200 gal.) with any of the sprays recommended.	
Atomic Sulphur—	
20 lbs. to 200-gal. tank for all purposes listed.	

Insect Pest Control in Southern California

(Continued from page 32.)

Citrophilus Mealy Bug.

The biological method of pest control has received added impetus the past year mainly on account of the rapid spread of the citrophilus mealy bug (*Pseudococcus gahani*) throughout the citrus growing sections. It is now found in every citrus county in Southern California with the exception of San Diego and Imperial.

Neither fumigation nor spraying have proven an effective means of control against this pest, consequently the fight against it centers around the quantity production and liberation of its natural enemies. Unfortunately the internal parasite (*Leptomastidea abnormis* Girault) which plays so important a part in the control of the

citrus mealy bug (*Pseudococcus citri*) does not attack the citrophilus mealy bug, therefore reliance must be placed on its predatory enemies, principal among which is the ladybird beetle, *Cryptolaemus montrouzieri*.

Insectaries have been established in every county of Southern California except Imperial, from which a supply of these beetles as well as other predators may be obtained.

The first step in the fight against the mealy bug is to exterminate the Argentine ant if present. This ant protects the insects from their natural enemies and as long as they are present, not much headway can be made against the mealy bug.

Control of Argentine Ant.

The Argentine ant is readily and effectively controlled by means of a poisoned syrup made according to the "Government formula," United States

Department of Agriculture. This is placed in suitable containers, usually small spice cans dipped in paraffin to prevent rusting, with a hole punched in one side near the top. They are then distributed throughout the grove, the cans being hung on small nails driven into the trunks of the trees above the ground.

The next step is to band the trees with burlap, the bands being placed around the trunk below the crotch. These bands provide protection to the adult mealy bugs, which congregate therein in great masses during the egg-laying period. They also provide ideal conditions for the establishment and propagation of the predatory beetles, the larvae of which feed on the mealy bug in all stages, as the rapidity with which a colony will establish itself and become effective depends mainly upon the amount and availability of the food supply.

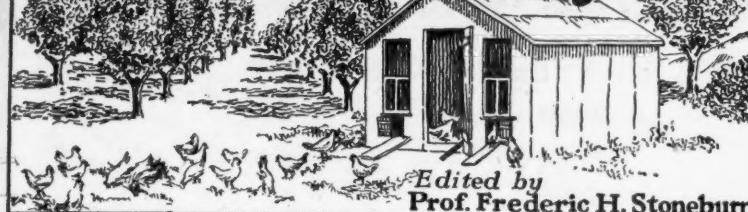
It is confidently expected that by breeding these beetles in large quantities and liberating them in infested groves, the fight against the citrophilus mealy bug will be won and that it will be reduced to the same status as its near relative, the citrus mealy bug, which is kept in subjection satisfactorily by the biological method.

Lemons by Water

CARLOADS of lemons are being shipped from San Pedro, Calif., to New York by boat by way of the Panama Canal. The trip takes 15 days and the fruit is arriving in very good condition. It is believed in a relatively short time the tonnage to be shipped this way will be greatly increased.

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Profitable Poultry



Edited by
Prof. Frederic H. Stoneburn

The Spring Chicken Crop

IN THE preceding issue of this publication, certain reasons were presented to show that fruit growers are in especially favorable position to profitably keep poultry on a commercial scale; not merely keep a few birds for the production of the eggs and chickens required to supply the family table, but a flock of sufficient size to produce a very considerable income.

That means anywhere from 300 to 1000 layers, in short, a real poultry department of such importance as to warrant the investment of sufficient capital to properly equip the plant and the attention of one or more capable people who will assume full responsibility for the enterprise. The effort should be to maintain as many birds as can be handled without interfering with the leading crop, and that is a matter of judgment and experience. Each fruit grower must decide this question for himself. Those who are entering the poultry field seriously for the first time, who have not previously kept fowls on a commercial basis, may well make the experiment on a restricted scale with, say, about 100 layers the first winter. Expansion can then be made as experience is gained and results justify. The majority will quite naturally specialize in the production of eggs, though some may prefer to take up the growing of choice table poultry, a specialty which is very promising at this time. The following remarks are addressed primarily to the egg farmer.

As early-hatched pullets are the most dependable layers of winter eggs, and as eggs produced during the cold season bring the highest prices, one naturally will endeavor to grow the required number of pullets each year to make up the greater part of the laying flock. This is the universal custom among specialists in this field. This is, perhaps, the most trying and important work of the poultryman's year. Any mistakes in the mating of the breeding flock, or the hatching and rearing of the chicks, will show up when the flock is in laying quarters and due to shell out the eggs. Then it is too late to correct the errors and a year is lost. Hence the thoughtful grower of poultry will carefully consider the various factors involved, plan his work in advance and provide everything required to enable him to work his plan. He will have things ready, will not be compelled to resort to last-minute make-shifts, with consequent unnecessary trouble and loss.

Keep nothing but standard-bred, uniform birds, preferably all of one breed and variety. Mixed flocks are not usually satisfactory; scrubs or mongrels are unworthy of attention. And, if possible, use birds of a breed-to-lay strain and so get immediate benefit of the years of work on the part of some careful breeder. Such stock costs more but it is worth heaps more, not only to the present generation but the many generations which follow.

There are many good breeds—many good hens in all breeds. There is no one breed which is best for all purposes and under all conditions. At the risk of offending certain fanciers, I will state my conviction that the most popular of the white-egg producers is the Single-Comb White Leghorn, and of the general purpose, brown-egg breeds the leaders are the Plymouth Rock, Rhode Island Red and Wyandotte.

If your present stock is not the right

breed or the right quality, do not breed it this year. Buy your chicks ready made (baby chicks) from some dependable hatchery which offers the breed and quality of youngsters you require. You can thus secure, at reasonable prices, exactly the kind and number of chicks you need and at the time you want them. This is at once a simple and satisfactory way of solving the problem of chick supply.

Arrange to hatch your chicks, or have them delivered, at suitable dates. To make dependable fall and winter layers, the Rocks, Reds and Dottes should be hatched in March and April, the Leghorns in April and May. As such chicks are in heavy demand, chick buyers will do well to place their orders early to avoid disappointment. If you plan to buy chicks, order them soon. If you will hatch them, mate up the breeding flocks and get the incubators in shape for service.

If equipment permits, it is generally best to raise all the pullets at the same time. As adult birds they will then all be of the same age. If you use the same equipment to rear two lots of chicks the same season, there must be six to eight weeks' difference in their ages. In my opinion, the best plan for a plant of moderate size is to have enough equipment to permit the growing of the desired number of pullets without having too great a difference in their ages.

Do not make the mistake of rearing too few chicks. Better to have more pullets than you need, and sell the surplus, than to be compelled to buy the additional number required to fill up the laying pens when the fall round-up discloses a shortage of potential dollar-producers. Provide about three times the number of chicks as the required number of pullets. This will allow for average mortality, for 50 per cent cockerels and a number of cull pullets to be discarded. Expert rearers of chicks can accomplish this with a less number of chicks at the start, others may require even more; but the three-for-one basis is safe under average conditions.

In order to grow any large quantity of chicks, it is necessary to resort to artificial methods of brooding. Mother hens are all right, as far as they go, but a busy man can scarcely afford to fuss with a hundred hens (even if he can find them!) with 15 chicks each, when three brooders will care for the entire 1500 chicks with a minimum of labor and annoyance.

Of all brooding equipment, the modern colony brooder is the most satisfactory and efficient. These big self-regulating machines will brood from 300 to 1000 chicks each, depending upon their size and the skill and experience of the attendant. A flock of not more than 300 chicks is most satisfactory for the average operator. Colony brooders burn coal, oil and gas. Personally, I prefer the coal-burning type and this seems to be most popular generally. These dependable machines are not expensive to buy or operate, they save time and labor. And they do grow mighty good chickens. For those who will brood few chicks, a hundred or so, the compact lamp-heated hovers will prove satisfactory. There are many good brooders of this type on the market.

When using the large colony brooders, the common practice is to place each machine in a roomy pen or, better

(Concluded on page 43.)

CATALOG FREE

12 Apple Trees
Standard Varieties, Guaranteed Trees
4 ft. average
Easily worth \$10.
\$3.15

WONDERFUL BARGAINS
In Trees, Fruits, Shrubs, Plants

Prices down now—mine are lowest because my plan of selling direct from nursery to you ELIMINATES ALL WASTE, ALL EXTRA EXPENSE. NO COMMISSIONS TO PAY, NO TRAVELING EXPENSE.

Being the actual grower on a large scale in my 40-acre nursery, my prices are based on large volume, small orders. I can offer you the best quality at the lowest price. THE QUALITY OF YOUR MONEY EVER BOUGHT FROM ANYONE, ANYWHERE, ANYTIME.

"IMOGENE"
Wonderful New Raspberry
Biggest Grown

IMOGENE RASPBERRY
FREE To Customers

The biggest grown—very juicy, delicious flavor. The pride of the neighborhood where ever grown—only a small supply of these plants available—and these I WILL DISTRIBUTE AMONG MY CUSTOMERS FREE of charge on a special proposition. Write today for full particulars. Try one of these wonderful propositions.

Rosebushes Given Away

To advertise FERRIS QUALITY—to make NEW CUSTOMERS—new friends—to prove that I GIVE BIGGEST VALUES for the money—I will give all my early customers ROSEBUSHES FREE. Write today and get my big special offer.

Improve Your Lot

A few dollars spent right now for the right plants, trees, shrubs, etc., will do wonders in landscape and improving your lot, will add hundreds of dollars to values, to say nothing of the beauty and charm created by the various colors embodied in shrubs, plants and ornamentals.

31 Shrubs \$7.00

Picture above contains 12
Crimson Rambler Rose, 10 Spirea Van Houttei, 5 Sweet Alyssum, Watermelons, a collection that would cost thousands what I ask anywhere else. My special advertising, get acquainted offer makes this a real bargain for \$7.00. Other bargain landscape collections and pictures in catalog.

EVERGREENS

Millions of trees waiting for you in our nursery, every size, any variety. From the ORNAMENTALS, many of which should be set out on lawns, to the evergreens varieties which should shelter every farm home to save fuel and protect live stock against winter cold. Many hardy southern varieties of evergreens are hardy northern varieties with fully developed root systems and are all sold under guarantee. Hanging in price from \$2.50 per 100 up.

BARGAINS

When I say my prices are lowest I mean it. My customers are here to back it, and to convince you list below a few of the many bargains contained in my catalog—Don't miss this great opportunity.

Strawberries, choice 3 varieties	100 for \$1
Berry (Jap.), 1	50 for \$1
Hawthorn, 10 Spirea Van Houttei, 5 Sweet Alyssum, Watermelons, a collection that would cost thousands what I ask anywhere else. My special advertising, get acquainted offer makes this a real bargain for \$7.00. Other bargain landscape collections and pictures in catalog.	12 for \$1
Concord Grapes, choice of three varieties	12 for \$1
Blackberries, choice of three varieties	12 for \$1
Red Currants, choice of three varieties	12 for \$1
Iris, the oldtime garden favorite	2 for \$1
Snowberry one year size	5 for \$1
Indigo, 100 for \$1	6 for \$1
Roses, choice of seven varieties	4 for \$1
Asparagus	4 for \$1
Gardenias	25 for \$1
Gladiolus Bulbs, assorted varieties	25 for \$1
Asparagus	25 tor \$1

Your choice of any 6 of the above Bargains, **BIG CATALOG FREE**.

EARL FERRIS NURSERY CO.
465 Bridge St. Hampton, Iowa

Order Your Fruit Trees

From "Nurserymen - Orchardists"

Last season we harvested from our own commercial orchards one of the largest and most profitable crops in 38 years. We have ready for Spring shipment tens of thousands of thrifty young trees, budded from selected bearing trees in our vast commercial orchards. Healthy, well-rooted and true to name. We concentrate on the great money-making varieties—Carnation, Hiley, Belle of Georgia, Elberta, Ray and Brackett.

Each of these is fully described and pictured in our 72-page book, "Nurserymen-Orchardists," also other commercial varieties of Peaches, Apples, Pears, Plums and Cherries. Nor do we neglect the Small Fruits which are so often big money makers, bringing quick returns. The Apple Chart shows at a glance the season, quality and range of the leading varieties. Other pointers are of value, even to experienced growers. This thick, interesting book is yours for the asking. Write today. Get our direct-to-the-planter prices before placing your planting order.

Harrison's Nurseries

Box 52, Berlin, Maryland

"The Largest Growers of Fruit Trees in the World"

EVERLAY BROWN LEGHORNS

The beautiful business bird! Wonderful winter layers. Big winners in all contests. Greatest winners New York, Chicago, Hardy, vigorous money makers. Stock Eggs, Chicks, shipped safely. Catalog free.

BABY CHICKS Postpaid to you. 100% live arrival. Purebred Barred Rocks, Reds, Anconas, 25-\$4.50; 50-\$8; 100-\$15. White or Brown Leghorns, 50-\$7; 100-\$13; 500-\$60. Etc. Ten other breeds. Catalog free. Bank reference, Booth Farms, Box 520, Clinton, Mo.

PURE-BRED POULTRY Most valuable varieties. Also EGGS and BABY CHICKS. Incubators, Brooders, Grain Sprouters, Supplies, Garden Seeds. Highest quality. Low cut prices. Illustrated Catalog mailed FREE. Address Nichols' Poultry Farm, Box 51, Monee, Illinois

QUALITY Chicks & Eggs

46,000 PURE BRED BREEDERS. 15 varieties. Best laying strains. Incubate 25,000 eggs daily. Catalog Free. Pre-war prices. Free live delivery.

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BABY CHICKS PREPAID TO YOU 100 PER CENT ALIVE Hatched From Vigorous, Heavy-Laying, Pure Bred Flocks

Varieties.	Prices on	50	100	500	1000
S. C. W. & Brown Leghorns, Anconas	\$7.50	\$14.00	\$67.50	\$130	
Barred Rocks, S. C. Reds	8.50	16.00	77.50	150	
Wh. Rock, Buff Orpingtons, Wh. Wyandottes, R. C. Reds	9.00	17.00	82.50	180	
Buff Rocks, Wh. Orpingtons, Blk. Minorcas, Black Langshans, Light Brahma	9.50	18.00	87.50	170	
Assorted, Heavy Breeds	7.00	13.00	62.50	120	
Assorted, all breeds mixed	5.50	10.00	47.50	90	

Get our free catalog. Reference, Millikin National Bank. Order right from this adv. Save time.

HAYES BROS. HATCHERY, Box N-5, DECATUR, ILL.

REILING'S HIGH GRADE CHICKS

You want healthy, vigorous, pure bred chicks—the kind that mature quickly and develop into early layers. We have them—"HIGH GRADE and SPECIAL CERTIFIED BLOOD TESTED MATINGS." For six years they have been the best investment for thousands of chick buyers from coast to coast. Better than ever for 1924. Fourteen best paying varieties. Moderate in price. Satisfactory Service. Our big, illustrated chick catalog gives complete information; it's free; write for your copy today.

LAWTON A. REILING, Dept. 54, BELLEVUE, IOWA.

One of the largest hatcheries and distributors in the world.

Write for the Free Book



Olde-Tan Team Lines

\$ 5 45
A Set

These lines are offered to you at price which represents only the actual cost plus mailing. We are making this offer to put a sample of Olde-Tan leather in your hands. We want you to see and feel this real old fashioned white oak bark tanned leather, the very same leather used in Olde-Tan harness. This offer will not appear again except as an advertising offer so take advantage of it now before it is gone. Write now. Ask us to send you a set of lines.

20 Feet Long
1 Inch Wide
Main Line Double and
Stitched at Center



Metal - to - Metal Construction

\$ 7.50
DOWN

*Puts it
on Your Horses!*

WRITE TODAY for the Free Olde-Tan Metal-to-Metal Harness Book which tells you how, for only \$7.50 down, you put this Olde-Tan metal-to-metal harness on your horses. You don't need to send any money. We send the harness before you pay a cent. After the harness reaches you, make the first payment. The balance may be paid at the rate of a few dollars each month.

OLDE-TAN Harness is not a new fangled patented totally different and strange looking harness. Just the opposite is true.

Fully Adjustable It is a commonsense harness that looks like the harness you are accustomed to. It is fully adjustable, the same as your other harness. Closer inspection, however, shows that at many points it is different and a great improvement on all other harnesses.

Metal to Metal Every strap is 100% protected from all contact with metal rings and loops by our metal protectors. At every point the chafing and rubbing is between metal and metal. This easily gives double life to the straps.

Practically No Buckles There are but few buckles instead of the fifteen you usually find on a harness, yet we give you every adjustment you have always had. Buckles are done away with wherever strength is needed (buckles

cut down the strength of a strap 30%) yet we give you the few buckles you need for convenience in taking off and putting on the harness.

Common-Sense Judgment

And so it is from beginning to end — every item has received such practical and commonsense consideration that you instantly appreciate its general all around superiority and practicability. Your own commonsense judgment will tell you this harness will easily give you double wear at least.

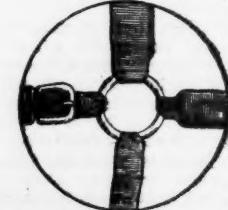
Quality Leather

But big as these commonsense improvements are, they would not amount to much unless we had the quality of leather to go with it. For this reason, we say the *only big reason* for OLDE-TAN success is the leather itself. Olde Tan leather is the best harness leather in the world, tanned by a family of tanners—70 years reputation and experience back of every strap. The same old time quality (slow process tanning) now as 70 years ago. You know what that means when it comes to wear. Every Olde-Tan Harness is made by the same men who tan the leather.

Don't let another day go by without receiving the booklet giving you the details regarding Olde Tan harness. It will be the means of cutting your harness expense in two.



Metal-to-metal construction. All wear is metal against metal. Leather held tight without play or friction. Note special riveted metal extension in breeching.



Never this wearing and cutting of straps in metal-to-metal construction. All pull, strain and wear is on metal.



BABSON BROS.

19th Street & Marshall Blvd., Dept. 26-02 Chicago

Please send me free your Olde-Tan Harness book and all about your \$7.50 down and easy monthly payment offer on Olde-Tan Harness.

I am not including \$5.45 for lines.

Print name and address plainly

My Name.....

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WRITE
for the Free Book Today!

It tells you just why you should replace your old worn out harness with Olde-Tan long wearing metal-to-metal harness. Learn how the leather is tanned to give its superior quality. Learn all about our liberal \$7.50 down and easy monthly payment offer. Send for the book at once.

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Distributors of Melotte Cream Separators and Edison Phonographs.

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Oil Spray Suggestions

by Leroy Childs

Hood River Experiment Station

DURING the past few years oil emulsions for orchard spraying have received more attention by investigators throughout the country than any other contact insecticide. Throughout the Middle West and Southern fruit-growing districts this energy has been directed towards the controlling of San Jose Scale; in the citrus districts of Florida and California for various scale insects attacking orange, lemon and grapefruit trees, and in the Pacific Northwest largely for the control of the fruit tree leaf roller, though the popularity of oil sprays are rapidly in-

cently found its place as one of our leading insecticides.

Unfortunate Results Occurred in Early Use of Oil.

During the early commercial trials of oil sprays applied to fruit trees, some unfortunate results occurred which blacklisted this material. Whether due to faultily prepared emulsions or due to applications made at the wrong season of the year, a number of orchards were seriously injured and some killed outright. The publicity resulting from these occurrences naturally made in-



Fig. 1—Not enough attention is given to spraying the tops of trees. Above 22 feet much care must be given to cover all parts. Spray from a tower or rig if there is much spraying of this sort to do. (First or bottom line in photograph represents a height of 5 feet; next line, 12 feet—spray rod extended to limit; third line, 17 feet—limit of effective work; top line, 22 feet.)

creasing in this fruit-growing area because of the benefits that can be derived as a means of controlling scale.

Oil emulsions are by no means new additions to the list of available insecticides. These materials were known and used by some of our earliest economic entomologists, not in the standardized commercial forms that are on the market today, but are similar to the home-made product that is proving quite popular and effective at the present time. The efforts of these earlier entomologists in popularizing oil sprays, however, did not take place to any great extent for some reason or another, and as a result this material has only re-

vestigators very conservative with reference to their recommendation and made fruit growers very skeptical as to the advisability of applying oil in any form. For a good many years following these unfortunate experiences, oils were used only to a very limited extent. Then in 1908-1910 came a very serious outbreak in Colorado of the Fruit Tree Leaf Roller, a ravenous fruit and leaf-eating caterpillar. After testing practically every known insecticide that offered any promise whatsoever, Gillette and Weldon demonstrated that heavy oil emulsions were the only material that could be relied upon to give relief in cases of serious infestation. Four years later the writer



SPRAY MATERIALS AND DUSTING MIXTURES

Will Help You Make—

BETTER FRUIT — BETTER PROFITS

Write for our SPRAYING and DUSTING GUIDE and pamphlets describing—

KASULIME: the famous "dry-mix" summer spray which controls scab and brown rot on peaches.

LIMEBOR: the best summer spray for apples. Better than Lime-Sulphur solution because it controls scab and fungous diseases without causing leaf injury.

NAPHICIDE: the new "gas-dust" which kills all forms of aphid. The most perfect means ever devised for the application of Nicotine.

We manufacture—

ARSENATE OF LEAD CALCIUM ARSENATE
BORDEAU MIXTURE COPPER-LIME DUSTS
SULPHUR DUSTS PARIS GREEN KALIBOR

Write for our prices.



If we are not represented in your district ask for information concerning our AGENCY PLAN

Send Today for Full Details About

"Fruit-Fog"

The Biggest Thing in Spraying

Use less solution, spray faster, and do a real job! That is possible with Hayes FRUIT-FOG, the result of 300 lbs. guaranteed pressure and the famous Hayes spray nozzle. FRUIT-FOG forms an atomized superspray of wonderful filtering and adhering power which gets to and kills ALL the diseases and pests which destroy your crop. You get more fruit in poor years, better fruit in good years—*more profits every year!*

Cut Your Spraying Costs

You can now suit your ideas of price and get the famous Hayes "Fruit-Fog" Sprayers in sizes 3½ to 16 gal. per minute capacity, with or without trucks, engines, or equipment. The smallest Hayes Sprayers have the same high pressure, long life, and corrosion proof pumps as the largest.

Send for Catalog

Showing complete line—and get advice of spray experts on your requirements.

Distributors and Dealers in all principal cities.

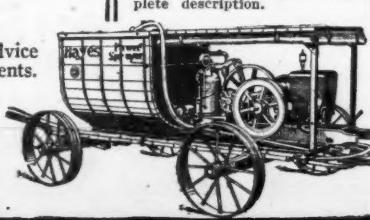
HAYES PUMP & PLANTER COMPANY
Dept. 12 **Galva, Illinois**
Full line of Power Sprayers, Traction Sprayers and Hand Sprayers.



Hayes "FRUIT-FOG" Sprayer Without Equipment

You can get any size Hayes "Fruit-Fog" Sprayer without equipment if you wish and get "Fruit-Fog" results at minimum cost. What you lack we will furnish at rock bottom prices consistent with Hayes quality.

Hayes 1903 (Below)—A 150-gallon sprayer which has made a nation-wide reputation. Send for folder, which gives complete description.



HAYES "FRUIT-FOG" SPRAYERS

kills them every time

HALL'S Nicotine Sulphate kills plant lice and similar insects. You can depend upon it to rid your trees of these pests. Being a vegetable extract, it will not harm fruit, flower or foliage.

It is very economical also. Made up as a spray, it costs less than 2c. a gallon.

Buy from your dealer. If he is not supplied, send us your order along with his name.

HALL TOBACCO CHEMICAL CO.
212 Fifth Ave., New York City.



10 lb. tins . . \$13.50
2 lb. tins . . 3.50
½ lb. tins . . 1.25
1 oz. bottles . . 35



Government Supervision

IT is quite generally thought that because the Government exercises the closest supervision of the chemical composition of insecticides and fungicides that it is almost impossible for one brand to be better than another. This is not the case, for the Government does not limit the physical improvement of spray materials such as finer particles, greater adhesiveness or more even spreading, except as regards any additions such as spreaders or glues. Therein is where

LUCAS

Arsenate of Lead
more than complies with Government requirements. The particles are of the very finest, insuring greater suspension and more uniform mixture. This fineness causes the particles to stick without the use of glue, just as fine dust sticks to window panes through hard rains. And furthermore, this fineness does not cause cohesion, the tendency of very fine particles to group together into apertures, because of the special Lucas Cohesion Neutralizer—which is not what is known as a "spreader". "Spreaders" dilute the poison 10 to 20% and are therefore not allowed in insecticide and fungicide packages.

Put Up In Powdered Form

No freezing, lumping or difficult mixing. No freight to pay on water—which constitutes about 50% of paste mixtures. Sold in convenient and sift-proof containers of from 1-lb. to 200-lb. sizes. Send for the Lucas Spraying Guide.

John Lucas & Co., Inc.
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NEW YORK PITTSBURGH CHICAGO BOSTON OAKLAND LOS ANGELES MEMPHIS SAVANNAH
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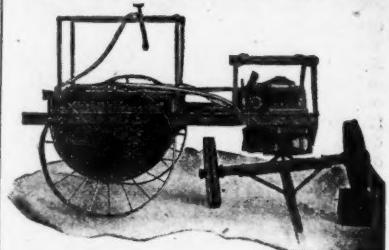
Lucas

Insecticides-Fungicides

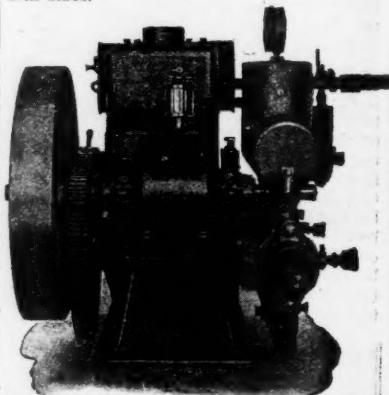
"Purposely Made for Every Purpose"

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2. Bordo Mixture
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6. F. B. K.
7. Pruning Paint
8. Paris Green
9. Arsenicide
10. Fish Oil Soap
11. Sulphur
12. Blue Vitriol
13. Dry Lime Sulphur
14. Nicotene "40"

TRUE "FRIEND" SPRAYERS



The "Friend" type sprayer. Low down, short turning, easy drawing, made in several sizes.



"Friend" high pressure unit motor pump. Made in several sizes.

"Friend" sprayers have national distribution and greatly increased sales. Write for prices and specifications. Name this paper.



"FRIEND" MANUFACTURING COMPANY,
Gasport, Niagara County,
New York.

YOU'LL ALWAYS BE GLAD
YOU BOUGHT A FRIEND

KNIGHT'S

Strawberry—Raspberry—Blackberry
Currant—Gooseberry—Grape—Asparagus
Same high quality we have supplied for nearly
40 years, but we have made a

A Big Reduction in Prices.
Our catalog tells how to grow big crops of fine
fruit.

Champion—The Best Everbearer
and many standard varieties. Cultural direc-
tions make the book of great value—but we
send it free, write today.

David Knight & Son, Box 76, Sawyer, Mich.

BERRY PLANTS

TRANSVAAL UNIVERSITY COLLEGE

(University of South Africa)

Pretoria, South Africa.

Applications are invited for the post of Professor of Horticulture, at a salary of £728 per annum by ten increments to £988 per annum. Duties to commence as soon as possible but not later than April 1, 1924.

Applications (in duplicate) accompanied by recent testimonials, a certificate of health and a recent photograph, should reach the undersigned before February 6, 1924.

Citrus cultural experience will be a strong recommendation.

If the successful applicant come from overseas, passage money will be refunded to the amount of £75 if he be a married man and £50 if he be unmarried.

(Sgd.) A. A. ROBERTS, Registrar.



NEW 1924 model, blue steel.
6-shot famous "Frontier"
Special, swing-out hand-ejector
revolver with 5-inch barrel. Im-
ported from Spain, the equal of
any \$35 model, and specially priced
for limited time to new customers.
LOW PRICE SPECIAL .32 cal. \$12.65
or 38 cal. our No. 35A \$12.65
EXTRA SPECIAL our No. 260A latest 1924
model of blue steel. Each revolver has passed strict
Government test. 32-cal. 6-shot . \$14.95
32-20 or 38 cal. 6-shot . \$15.45

20-SHOT "PANTHER"

RAPID FIRE AUTOMATIC

LIMITED quantity of brand new, 32 cal. \$8.45

"Panthers," 10 shots with extra maga-
zine making 20 rapid fire shots. Special at

Above guns all shot any standard American cartridge.

PAY POSTMAN ON DELIVERY plus postage.

Money back promptly if not satisfied.

CONSUMERS CO., Dept. 81WW, 1265 Broadway, N.Y.

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tender cambium and sap wood tissues, because of tree dormancy, the oil remains about the cells sufficiently long to destroy this tissue. Where this condition is general the death of the trees result. At the time of spring application, sap movement prevails and there is little chance of freezes of sufficient extent as to cause extensive penetrations of the oil into the tree tissues.

Poorly Emulsified Oil Sprays.

The second cause for tree damage results from the use of poorly emulsified oil sprays. Oil of a heavy grade, in an unemulsified state, will cause tree injury. Free oil exists in the tank, particularly as the last part of the tank is sprayed if the oil spray has not been properly prepared. Trees sprayed with material of this character invariably develop injury to a more or less extent; often this is very serious. Poorly emulsified oil should never be used; it is economy to throw away the material in the tank rather than use it as spray, for two reasons: First, control will not be obtained, and second, the possibility of injury occurring. Where the emulsion is not properly made the liquid in the tank consists largely of two parts, oil on top and water in the bottom. As spraying proceeds,

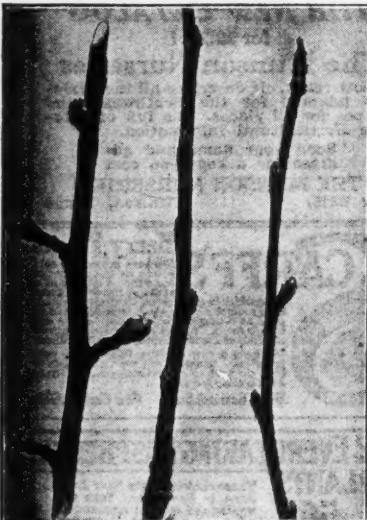


Fig. 2—Good bud development at which time to apply oil spray for scale, aphids and leaf roller. Fruit buds left; leaf buds right.

the trees receiving the first part of the tank are sprayed largely with water and those at the end of the tank largely with a sticky mess of oil unemulsified.

Red Engine Oil Emulsion.

At the present time there are available many brands of oil sprays on the market. Some of these materials are excellent; others good and still others of very poor quality. Growers who are using commercial oil sprays should be careful in making their purchases. Use only established lines of proved articles. Many failures in insect control can be traced to a poor grade of oil spray. A good commercial oil emulsion should contain well above 80 per cent oil, not more than eight per cent water and emulsifier in sufficient quantities as to produce a stable, readily prepared emulsion. The fruit grower also has the option of making his own oil spray. Many federal and state investigators have demonstrated recently the efficacy of the so-called Red Engine Oil emulsion. This is prepared as follows:

Red Engine Oil.....2 gallons
Potash fish-oil soap2 pounds
Water1 gallon

The oil, soap and water are placed in a vessel and brought to a vigorous boil. This can be done by either placing ingredients over a fire or by using live steam. While still hot, the materials are passed through a force pump twice at at least 60 pounds pressure. Pumping under pressure is necessary, an emulsion cannot be obtained by ordinary stirring. Properly



A LONG TIME INVESTMENT

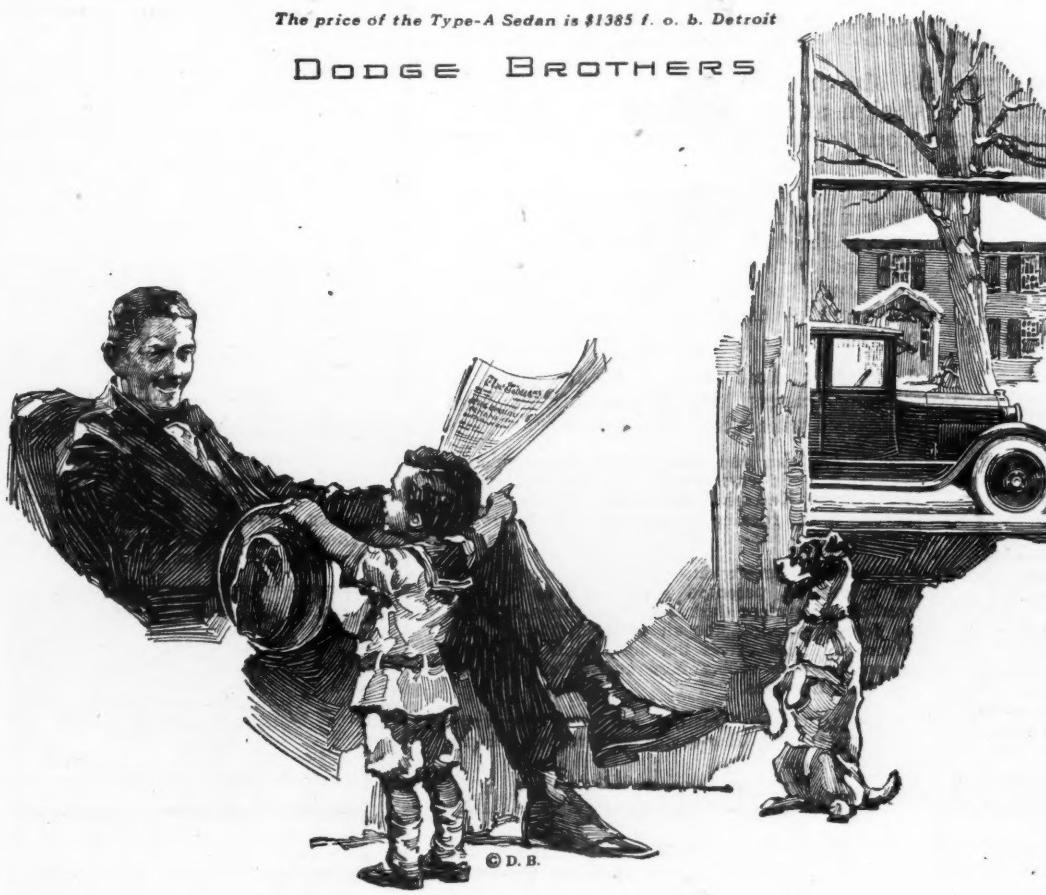
Every Dodge Brothers Sedan body is steel built throughout—sills, pillars, panels, frames and all.

This all-steel design—exclusively a Dodge Brothers feature—possesses certain practical advantages which recommend it most emphatically to the closed car buyer.

It reduces cost, assures a structural precision which is particularly evident in the snug fit of doors and windows, and results in a staunchness of construction which guarantees to the owner a long time investment—and a long time satisfaction.

The price of the Type-A Sedan is \$1385 f. o. b. Detroit

DODGE BROTHERS



Baskets for Apples, Peaches, Plums, Grapes, Tomatoes, Cucumbers, Beans, etc. Boxes and Crates for Berries, Cucumbers, Celery, Cauliflower and vegetables of all kinds.

PLANT BOXES
Catalog mailed on request
The Pierce-Williams Co. South Haven, Mich.
Janesboro, Ark.



Cultivated Whitesbog Blueberries

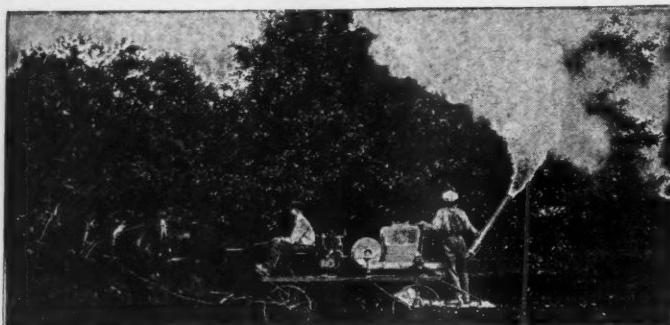
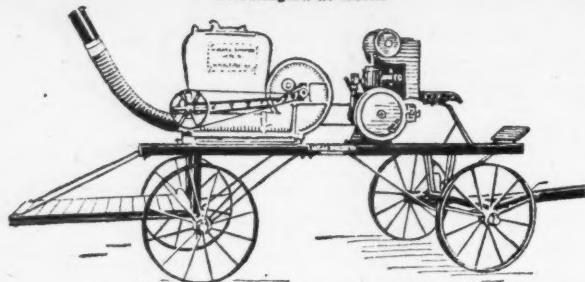
a popular and profitable fruit

Pure-bred Whitesbog Blueberries average well over one-half inch in size. Delicious, practically seedless. Have excellent shipping qualities. Command highest market prices. Bushes are vigorous, heavily productive. Every variety tested and named. Easy to pick, easy to cultivate, hardy, long-lived.

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This pen and ink drawing of the

Niagara Orchard DUSTER

shows you its sturdy, compact construction, its simplicity of design and its minimum of parts, all of which are your very best guarantee of its long working life.

It has been proven that season after season Niagara Dusters will keep on doing their work just as efficiently as the first day they were run—and that's one reason why fruit growers have found the Niagara method of protecting their crops less expensive than any other known method.

A glance at these features will tell you why Niagara Dusters, the pioneer dusters, have made good wherever fruit is grown.

The hopper, fan and fan housing are aluminum, light, strong and rust proof. The fan revolves on Hyatt Roller Bearings. The hopper holds 100 lbs. and has a big opening at top easily filled through large funnel.

But what has made dusting finally successful is the celebrated, patented Niagara cylinder of brushes. It sweeps dust free from lumps, through the feed-screen, into the air chamber, then a continuous air blast drives the dust atoms through a patented flexible rubber hose and metal discharge pipe onto the trees.

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Remember with the Niagara you and a boy can protect 5 acres of mature apple orchard, 6 acres of citrus grove or 4 acres of field crops per hour.

It will pay you to call on the Niagara dealer or write and find out just what model Duster and what Dusts are best to use. Our specialists are at your service.

Niagara SPRAYER COMPANY

Middleport, New York

Western Office, 2598 Taylor St., San Francisco, Calif.

Pioneers Makers of

Niagara DUSTS and DUSTERS

made, this emulsion will keep indefinitely; freezing, however, will cause it to break down.

For scale control a two to three per cent emulsion has been found to give good results. Three gallons of the above stock solution to each 100 gallons of water will give a two per cent emulsion. Where insects such as the leaf roller are to be controlled, the strength must be increased to at least six per cent.

The writer's experiences with oil sprays leads him to believe that most growers will eventually find it most economical in the long run to purchase commercial brands of oil sprays rather than to prepare their own even though the initial cost is higher. This has been true of practically all other spray materials now used. Standardization is established, the loss of time avoided when it is often needed for other orchard practices, and above all, when a good commercial spray is used, the chances of applying a spray possessing poor emulsifying qualities and accompanying possibilities of tree injury are reduced to the minimum.

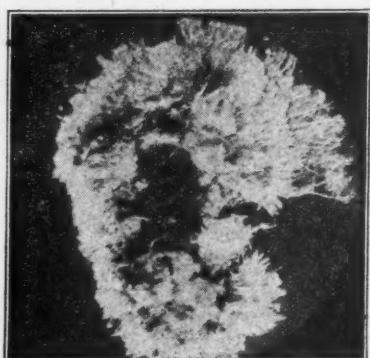
In the final analysis, oil sprays can not be efficiently used unless very careful spraying is done. Use plenty of material and cover every part of the tree. Scale can be present from top to bottom and it must be remembered that only those insects actually hit are destroyed. A little carelessness in allowing a few to survive can result in nullifying the efforts made towards the control of these pests. Poor results obtained in spraying in such cases are often charged to the material used when in reality the grower himself is at fault.

Figure I demonstrates a study that was made at Hood River to determine the effectiveness of spraying with the spray rods. Above a height of 22 feet extra care must be given with either rods or gun if all pests are to be covered. In orchards possessing an area of any great extent above this height, it is desirable to spray from a tower on the machine whether guns or rods are used. To cover tops thoroughly, some spray must be wasted—it will pay in the long run.

Citrus Insects and Diseases

(Continued from page 35.)

well as the injurious ones. The insects thus freed of their fungous checks increase and spread rapidly. Unless the proper insecticides are promptly used, trees are seriously in-



Pink fungus or purple scale (much enlarged).

jured, sometimes killed. By applying the combination, the fungi are destroyed, and at the same time, the insects that at the time are upon the trees. As the insects gradually return, their parasites usually accompany them so that the balance is maintained. This mixture is prepared by making Bordeaux mixture of desired strength, then adding concentrated oil emulsion to give one per cent of oil to the whole.

This Bordeaux-oil mixture is used for controlling scab on grapefruit and Satsumas in early spring on tender growth. Where much scab was present the previous season, it is advisable to make a spraying before growth starts, especially on young non-bear-

I grow every tree I sell. That's why I can absolutely vouch for their quality. My fruit trees are all propagated by experts, they are planted the proper distance apart, accurately grafted, and trained. They have the strongest and healthiest root systems to be found anywhere. They will grow and thrive when transplanted.

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MAY SEED & NURSERY CO.
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The Munson Nurseries

is now ready. It describes all the varieties adapted for the Southwest, and Grapes for all places. It's full of valuable Horticultural Information.

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ing trees; and for melanose soon after the petals have fallen.

A well-planned spray schedule for citrus includes the use of Bordeaux oil early in the season, oil emulsion after fruit are an inch in diameter for white fly and scale insects during the rather dry months of spring, the use of some form of sulphur for rust mite when they appear in serious numbers about June, the use of parasitic fungi during the rainy season of July and August, and a clean-up spray for white fly scale insects and rust mites, if they are sufficiently numerous in October or November, of oil emulsion with soluble sulphur dissolved therein.



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The gain a fruit crop makes when the trees are well fed is worth many times the cost of the fertilizer.

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Peaches. Nitrogen applications increase yield and promote vigor. Mr. L. B. Veeder of Baldwin, Ga., who regularly fertilizes his 12,000 trees, reports that Arcadian Sulphate put on late in February enabled trees to hold the fruit through a severe freeze.

Prunes. The response of prune orchards to nitrogen has been convincing. Arcadian Sulphate applied on the Blauer Ranch, Saratoga, Calif., for seven years, has averaged over 1,100 pounds gain of dry fruit per acre.

Grapes. Whether you produce grapes to be used fresh or for raisins, your vineyard needs nitrogen and will respond to its use. Mr. F. H. Telkamp of Parlier, Calif., applied Arcadian Sulphate to his vines and made an increase of 2,200 pounds of raisins per acre.

But—this isn't half the story. Write for free bulletins on the crops you grow. These bulletins will help you as they have helped others. Use the coupon.

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(Continued on page 50.)

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Timeliness of Apple Scab Control

(Continued from page 33.)

the upper and lower surface you will find minute black dots, hardly larger than the point of a pin, occurring in clusters. These are the winter or early spring forms of the fungus which causes apple scab.

The writer maintains that growers must familiarize themselves by close observation with these forms of apple scab. They must know, too, the nature of the parasite with which they are dealing. Apple scab is the name we give to the blemish caused by a fungus—a mold—which grows upon the apple fruit, leaves and twigs. A parasitic fungus is a low form of plant life whose vegetative body consists of threads and whose fruiting form is composed of minute seed-like structures called "spores." This fungus grows upon the apple as weeds grow upon a soil, sending its root-like growths into the tissues, and thus stealing its living.

Life Story of Scab.

The life story of the apple scab fungus is well known to technical

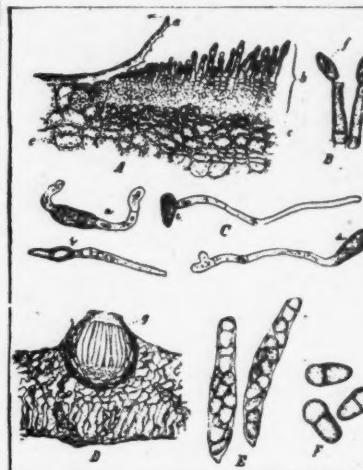


Fig. 3.—Apple Scab (*Venturia inaequalis*). Microscopic structure of the scab fungus. Section through a scab spot on an apple showing the fungus (b) spreading under and lifting the cuticle (a) from the partly disorganized cells of the apple (c); (e) healthy cells of the apple; B, two spore-bearing stalks giving rise to summer spores (conidia); (f) C, spores germinating; D, portion of section through an affected leaf of apple which has lain on the ground over winter and has given rise to the winter spore stage of the disease; (g) spore case (peritheciun) containing a bundle of spore sacs (asci); E, two spore sacs (asci), more highly magnified, each containing eight two-celled winter spores, three of which are shown at F. All highly magnified. (After Longyear.)

workers in horticulture and it should be well known to practical growers. Such knowledge is vital if the fine points in control are to be practiced. The life story of this "weed" which grows upon the apple foliage and fruit is fairly simple, and by reference to the diagram accompanying this article may readily be followed (Fig. 3). In considering this diagram, note that the fungus, or mold, is shown enlarged many times and what you are viewing are thin slices of the diseased tissue showing the fungus as it appears upon the affected part.

In the spring, while the apples are still dormant, the apple scab fungus is developing on the fallen leaves of last season. All through the winter the fungus has been ramifying in the dead leaf tissue and has completely impregnated the leaf. In early April in our section, the winter stage of the fungus is developing as the small pinpoint clusters of black spore cases already mentioned (Fig. 3 D). With every hour of growing temperature, the spore cases grow in size and eventually mature their spores. These spores are peculiar bodies, admirably produced to accomplish their purpose, viz., the producing of scab. They are formed inside of tube-like sacks and when ripe, and when wet by warm

(Continued on page 51.)

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All the well-known, tried and tested standard varieties of fruit plants, produced under the most favorable conditions in quantity in the Michigan Fruit Belt at low prices.

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Choice Strawberry Plants \$3.75 per 1,000. All standard varieties. Guaranteed first-class or money refunded. Catalog. MRS. FILENA WOOLF, Dept. D., Allegan, Mich.

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MARKETS AND MARKETING

REAL winter weather, in fact 18 below zero, greeted the delegates to the sixth annual convention of the American Fruit & Vegetable Shippers' Association when they arrived in Chicago January 5. However, the below zero weather did not stop the meeting and a record attendance was on hand at the opening session at 2:00 p. m. in the main ballroom of the Drake Hotel.

The meeting was called to order by President Charles E. Virden and in his snappy characteristic style welcomed the members and guests and then set forth a few of his ideas as to problems that should have the attention of the association during the coming year. President Virden pointed out very clearly that in his estimation there were too many trade associations and went on record as being strongly in favor of a merger or other means of drawing the trade bodies closer together and thereby eliminate a great deal of duplication of effort. This suggestion was met with applause from the delegates in general, indicating that the same thought was in the minds of many present.

Transportation problems in general were discussed and, with reference to rates, he stated that some revisions were imperative; that rates should be such as to justify and sustain a transportation service of merit, at the same time encouraging production and shipping.

A general discussion followed and a great many subjects were covered during the following sessions and on Tuesday afternoon officers for the ensuing year were elected. The new officers are F. E. Nellis, president; John Denney, first vice-president; A. U. Chaney, second vice-president; Joe Steinhardt, third vice-president; Ray Hanley, sergeant-at-arms, and the re-election of E. S. Briggs as manager-secretary.

SOUTHERN California orange shipments during the first week of January were 474 cars as against 206 cars the previous week. Central California shipped only 206 cars as against 255 cars the previous week, and Northern California 20 cars as against 23 cars.

The total shipment of oranges and lemons combined were 806 cars for the same time as against 549 the previous week. For the season up to January 8, California has shipped a total of 8,953 cars of oranges and lemons.

STRAWBERRY growers are busy at this season of the year. Florida reports their crop is not as far advanced as a year ago and a lighter yield per acre seems probable. The present movement is increasing and reports from the prominent shipping points at the time of going to press indicated that by the middle of January shipments would be heavy.

Tennessee reports that their 1924 strawberry crop will be increased several hundred acres over last year's crop. Growers are setting out plants by the thousand and 1925 promises to bring forth a bumper crop. In one day more than 100,000 strawberry plants were received at a local office consigned to one grower.

In the Sarcoxie section of Missouri a great deal of interest is being shown among the strawberry growers and it is estimated that about 285 cars will be shipped this season.

Howell County (Missouri) reports that the strawberry growers in this section are getting organized and are making plans for increasing the acreage in their county so that shipments

can be made to central markets in cars. Adjoining counties are showing a marked increase year after year.

Bald Knob, Ark., also reports marked activity in strawberries and formation of the Bald Knob Strawberry Ass'n.

THE annual meeting of the Martinsburg, W. Va., Fruit Exchange, an organization through which the principal growers of this section market their apples, was held the latter part of December and proved to be a very successful meeting. Statistics released at this meeting show that the apple crop from Berkeley, Jefferson and Morgan counties amounted to 1,400,000 barrels, which means an approximate net profit to the growers of \$3,375,000. About 10 per cent of the crop is still in storage.

THE 1924 grape outlook for California was covered very fully at the fifty-sixth State Fruit Growers' and Farmers' Convention held at Santa Ana in December. Director George H. Hecke, in his report, referring to the grape problems, said:

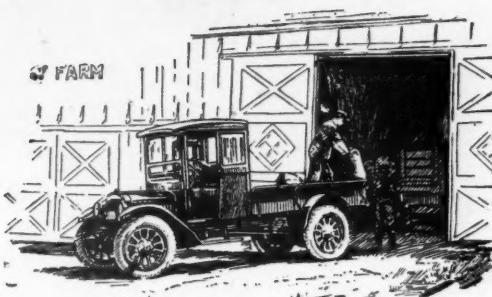
"Probably the most dramatic situation in California at the present time, so far as the farmer is concerned, exists in the grape and raisin industry. There are over 600,000 acres of all classes of grapes, bearing and non-bearing, in California at the present time. The San Joaquin Valley, especially the lower San Joaquin Valley, depends essentially on the raisin industry and thus making this crop one of major importance to the state. The high prices received during the war resulted in tremendous increases in plantings, but while prices could be controlled in a measure, it was absolutely impossible to control production, and as a result production has increased to a point where new markets must be sought all over the world if the raisins of California are going to be marketed successfully."

"This season there were shipped out of California in the fresh state approximately 50,000 cars of grapes of all classes. This tremendous total represents an increase in shipments during the past 10 years unparalleled in any line of agricultural production. As late as 1916, less than 10,000 cars of grapes were shipped out of the state. Next season, with normal weather and crop conditions, there will be in excess of 60,000 cars of this commodity alone to be moved. A general demoralization in the fresh grape market may be anticipated unless serious attention is paid to the quality, condition and manner of packing of this commodity."

TOTAL apple shipments from the Wenatchee Valley to January 1 were slightly less than 13,400 cars of about 78 per cent of the total crop, which is now estimated by shippers at less than 17,500 cars. Not quite 1200 cars were moved during December. The weather has been favorable for the movement of the fruit, but owing to the condition of the market, there is no disposition on the part of shippers to hurry the apples eastward.

Last year only about 7800 cars had been moved to January 1, or about 57 per cent of the crop, and two years ago 12,250 cars had been moved, or 86 per cent of the total shipments for the season. Last season the big apple movement took place during January, when P. F. E. and U. R. T. cars to the number of about 2500 were received here and moved through the Spokane gateway.

General Motors Trucks



Power—Speed—Economy GMC TRUCKS

Speed on the highway—power to pull over bad roads or in the orchard—a large carrying capacity—these combined with economy of operation and maintenance are the essentials of a fruit grower's truck. And, in GMC is found a full satisfactory answer to every demand.

GMC is built for hard continuous service every part, both of engine and chassis, is made oversize for strength and to insure uninterrupted service throughout and even beyond the normal life of the truck. Moreover every moving part of GMC operates in a bushing or bearing that is quickly and easily replaceable.

Full information regarding GMC, its performance, construction, exclusive features and the economies it effects are given in our free illustrated booklet "Motor Trucks on the Farm." Send for your copy today.

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Every year shrewd buyers save money by buying their stock of baskets in February. Prices invariably go higher later in the year. So place your orders now and be sure and specify P. S. C. Baskets; the straight side, broad bottomed kind, extra well built of heavier veneer. They look better, ship better, store better and bring higher prices for your fruits or vegetables.

Write for 1924 Illustrated Apple Book

Every car lot shipper should have our 1924 Apple Book; packed full of valuable facts; also ask for prices on your year's requirements in bushel and half bushel baskets.

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22 Union Trust Bldg., South Bend, Indiana



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Care of Bees in the Spring

by H. F. Wilson

NORMALLY, we think of the different seasons of beekeeping as spring, summer, fall and winter. It would be much better if we were to start the year in the fall rather than in the spring. The beekeeper's year should be divided into two periods, the period of preparation for the honey flow and the period of crop production.

The first period extends from early fall until the time of the next year's honey flow, which may be from April to June, depending upon the section of the country. In the northern states this period would be from about August 15 to June 1. The period of honey production usually only lasts from two or three to six or eight weeks, and the crop gathered will depend to a very large extent upon the attention given the bees during the period of preparation.

If the bees are in first-class shape at the beginning of the honey flow, a maximum crop may be expected. If the bees are not in shape and have to build up during the honey flow, a minimum crop can only be secured.

Period of Preparation.

The period of preparation should begin by providing young queens. All colonies having queens more than two years old should be re-queened. Many of our beekeepers have found it advisable to re-queen every year. At a later period in the fall, conditions should be provided so that an abundance of young bees will be reared before brood rearing ceases in the fall. When a colony starts into the winter with many old bees and few young bees, the beekeeper will find his colonies dwindling badly in the spring. Up until recent years, spring dwindling was thought to be a disease but now we know it is due to the dying off of the old bees.

There is considerable difference of opinion as to whether bees winter better in the cellar or in out-door packing cases. As a whole, I believe, that bees packed out-of-doors are usually in much better shape at the time of the honey flow than bees wintered in the cellar. This is not because packing out-of-doors is a better system but rather because when bees are wintered in the cellar, they are not given the protection in the spring which ordinarily does exist in the case of bees packed out-of-doors. It is far more important that bees be in packing cases or double walled hives in the spring than it is in the fall or even winter. A comparison of the existing conditions in fall, winter and spring will help to point out the reasons for this. Experiments show that when bees do not have brood in the colony they can keep the cluster temperature at the required point without much loss of energy. On the other hand, during the brood rearing period, which always begins in the spring, it is not only necessary for the bees to keep up the normal cluster temperature but they must also create a higher temperature for the hatching of brood. In other words during the normal fall and winter period it is only necessary to keep the temperature up to from 70 to 80 degrees Fahrenheit in the center of the cluster while during the brood rearing period it is necessary to keep the temperature above 90 degrees Fahrenheit (also during the fall and winter period the bees are only consuming sufficient food to develop heat in the cluster) while during brood rearing they must not only keep the temperature at a much higher point but they also have to produce the food which goes to feed the developing brood. This, of course, requires large amounts of energy and if the colonies are in single walled, unprotected hives, they are easily affected by even slight changes of temperature. Cold spring winds easily penetrate the hives and drafts draw away considerable heat which would be preserved by even a small amount of protection, such as a slip-over cover. It is for this reason that colonies in packing cases have a much better chance to build up in the spring than colonies of bees in single walled hives. If the beekeeper has been careful to provide colonies with plenty of stores the previous fall, it is not necessary to disturb the bees until late in the spring when continued warm weather occurs.

Setting Out Cellar Wintered Bees.

For the bees in the cellar we must consider the best time for setting them out in the spring. The time when bees should be set out in the spring is generally based upon the blooming of the willows, and in the northern tier of states this takes place about the first of April.

A few beekeepers set out their bees as soon as the snow disappears, while the majority plan to set them out between April 1 and April 15. If outside protection is to be given, then bees may be set out at an early date at the convenience of the beekeepers. If they are not to be given outside protection, the time of their removal from the cellar should be governed by their condition and the weather. If any colonies are restless or suffering from dysentery they should be set out as soon as the weather is sufficiently warm for them to fly. On the other hand, if they are quiet and have plenty of stores they may be kept in the cellar as late as April 15. Investigations of climatic conditions in the north indicate that the first spring thaw normally comes between the tenth and fifteenth of March and that the next warm period is likely to occur between the twentieth of March and the first of April. Observations show that bees can fly with safety when the temperature in the shade is as low as 45 degrees Fahrenheit, provided the sun is shining brightly and cold winds are not blowing. Days of this kind appear in more than an average number of years after March 20 and before April 1, and if the snow is off the ground, a beekeeper may set his bees out with the assurance that they will be able to have a cleansing flight at that time. If bees are known to be short of stores, they should be set out during the warm spell in March and given sufficient amounts of sugar syrup to carry them over until they can gather nectar.

Planning the Spring Work.

At the first opportunity, when bees are flying freely, each colony should be examined to see if any one is queenless or too small to build up by the time of the honey flow. All such colonies should be united with others to make them of average strength. It is almost useless to keep colonies that do not cover five or six frames at least. At the same time, examine the stores to see if there is enough for each colony to produce a maximum of brood. Each one must have at least 25 pounds of stores at the beginning of the spring period, for maximum brood rearing. If conditions are such that the bees cannot gather nectar in the field, additional stores must be given later. If honey stores are not available, feed sugar syrup two pounds to one pound of water, heated until the sugar is thoroughly dissolved.

The next most important matter is to see that each colony has more than enough room for brood rearing. A ten frame hive body is not sufficient for a strong colony and two hive bodies should always be provided about the first week in May, or earlier if a colony has seven or eight frames with brood. The extra room will also be of great benefit in preventing swarming as it is the crowded condition in a colony which most frequently causes bees to swarm. If all of these details are taken care of, the beekeeper may be assured that when the honey flow begins he will have strong colonies of bees.



Making the Kitchen a Better Place to Work

by E. W. Lehmann

THE FARM kitchen has been rightly called the farm women's work shop. Every effort should be taken, therefore, in planning the kitchen, selecting and arranging the equipment, so that it will be not only an efficient work shop, but an attractive place to work and to bring one's friends, for most women delight in showing off the kitchen if it is one of which she is proud.

Whether you are planning a new kitchen or remodeling an old, the first questions would pertain to the room itself, its location, its size, the number of windows, the entrances, lighting, ventilation, the finish, etc. Some thoughtful farm woman said, "Locate the kitchen first and then plan the rest of the house to it." This is not such a bad idea; the kitchen should have a good outlook, it is well to be able to see the road, main entrance if possible, and the barns and other buildings from the kitchen windows. A corner kitchen with at least two windows for cross light and ventilation is desirable. If an outside entrance to the kitchen is provided, it is desirable to have an additional entrance for the men from work so they do not have to use the kitchen as a passageway. A farm hired girl, who took a pride in having a spotless kitchen, said the two requirements for a kitchen are: To plan it so it cannot be used as a passageway and so it cannot be used as a wash room.

To have more than three doors opening from the kitchen is usually a disadvantage unless the kitchen is unusually large. The large kitchens are going out of style because of the loss of time in preparation and serving of food. A kitchen practically square so that all equipment is in easy reach should not be much more than 140 to 150 square feet; however, many convenient kitchens are smaller than this.

For the convenience and happiness of the housewife, provide a floor covering that is easily cleaned and is grease proof. A good quality linoleum is about as good covering as one can get at a reasonable price. The walls are best finished with flat paint and all wood work enamelled so it may be easily cleaned. The lower part of the wall is better when covered with a sanitas or an oil cloth applied like paper. Many attractive tile designs can be secured that make the kitchen attractive and it is easily cleaned.

One authority on household subjects has emphasized the point that in buying equipment it should be put on the basis of making an investment. We should not think so much of the first cost, but on how many times the particular equipment will be used and how much time is saved at each use, and also the effect on the quality of job done.

No attempt will be made in this article to discuss all the great variety of equipment and devices, storage, etc., needed to make the kitchen a more efficient workshop. A few of the more important, more neglected and yet inexpensive pieces will be mentioned.

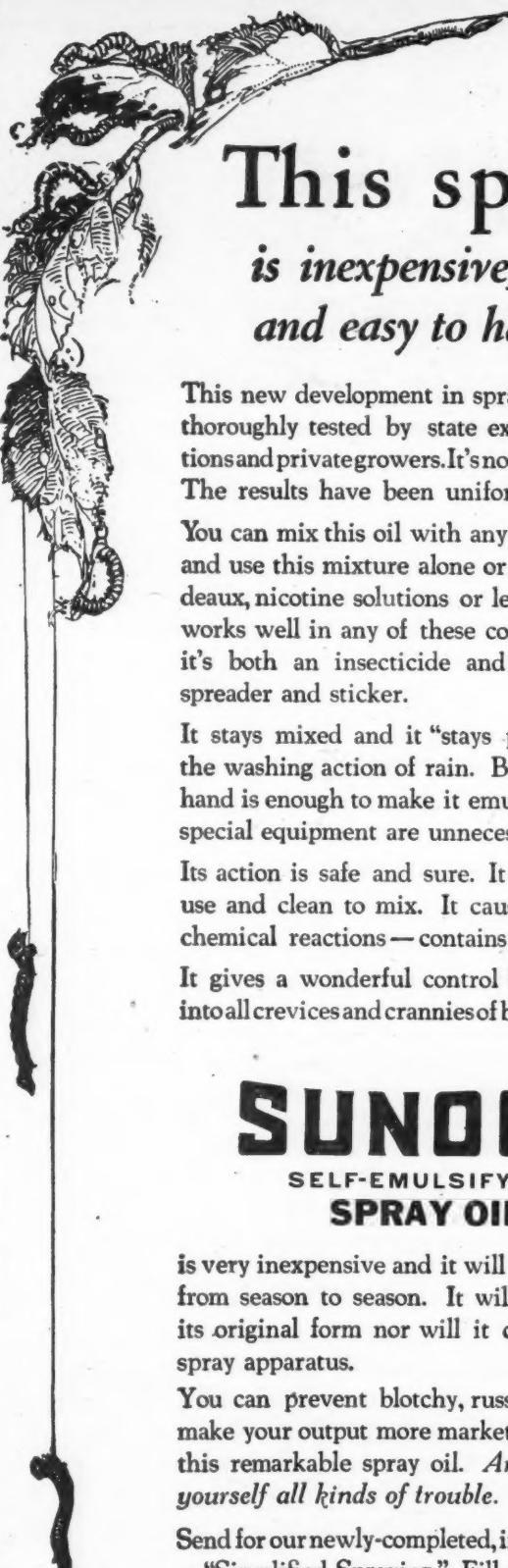
Water systems for the farm home were discussed in a previous article. A sink and drain, at least, should be

found in every kitchen. If there is no water under pressure a pump at the sink would be the next improvement along this line. We must not overlook the fact that once the kitchen is equipped with those things necessary for food preparation, the next most important is a means of providing water right at hand and to provide a means of disposing of the waste water, for water is needed at nearly every turn in the work of the kitchen.

Among the inexpensive items of equipment that add much to the convenience and efficiency of the housewife that I will mention is a simple, narrow shelf placed directly above the sink or work table. A lot of things needed many times during the day can be placed on this shelf in the plain view of the worker as an openly equipped carpenter's box brings his tools to view. Underneath the shelf put in a number of screw hooks. On these hooks will be found a convenient place to hang such articles as the dish mop, the egg beater, big stirring spoons, measuring spoons, small cleaning brushes, etc. It only takes a little time to put up such a shelf and the expense is practically nothing. A board, one by four inches, and a few simple brackets and screw hooks that can be secured at any ten-cent store is all that is needed. It is assumed that the housewife can bring enough pressure to bear to get it put up.

Another item of equipment that is inadequate in many kitchens is the storage space. Storage for dishes, storage for food, storage for pots and pans, storage for cleaning equipment and materials and just more storage is the continuous cry of many women. On investigation it may be found that the storage now available is not being used efficiently, much of the space is cluttered up with stuff seldom or never used. The best place for such stuff is in the attic or it should be sent to the first church rummage sale. Simple open front shelves make good storage space for the dishes, pots, pans, etc., that are used from day to day. Other provision must be provided for food. The kind and extent of storage space that can be built may be limited by the pocket book. Modern built-in storage is something most every woman would like to have and yet there is a lot of poorly used closed space in these elaborate cupboards. Other simple equipment that should be considered to make the kitchen more convenient should include a built-in fuel box open to the outside or to the basement for filling, a sanitary can for garbage, and a work stool and comfortable work chair.

With the idea of making better kitchens the household extension specialists of a number of the state institutions have worked out kitchen score cards. This work has been done in co-operation with the agricultural engineering specialist because of his knowledge of the mechanics of the problem. The farm women interested should secure a score card through either the county farm or the home agent. With the aid of this card she can gain a better idea of where her kitchen falls short of the ideal as set up by people studying this question.



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CHATS WITH FRUIT GROWER'S WIFE

By HAZEL BURSELL



House Flies Dangerous

"THE PRESENCE of flies is an indication of uncleanness, unsanitary conditions, and improper disposal of substances in which they breed. They are not only annoying; they are actually dangerous to health, because they may carry disease germs to exposed foods." Thus reads an indictment against the house fly in a bulletin put out by the United States Department of Agriculture.

It is necessary, therefore, that housewives, farmers and whole communities wage unceasing war against these disease and filth-bearing pests. One family alone can do very little towards keeping down the fly menace, but a whole community aroused to the need for concerted action can practically eliminate the fly.

Teach Control Measures.

The first step is to conduct an educational campaign through posters, lectures, pictures, the schools, etc., so that every member of the community will have exact knowledge of fly prevention and control methods found most effective and workable. Each must also come to realize the danger of disease epidemics through germs carried by the fly.

There are several kinds of flies, but the most universal and numerous is the common house fly. It is medium-sized and is distinguished from other types by four black stripes on the back. The house fly does not bite, as its mouth is made to suck up liquid substances. The body of the house fly is covered thickly with hairs and bristles of varying length, and this is especially true of the legs. Thus when it crawls over infected material, as human excreta or barnyard manure, it readily becomes loaded with germs, and later visits to human foods result in their contamination. Even more dangerous are the "vomit spots" deposited by the fly, which contain thousands of living disease bacteria.

It has been proven that house flies do not live through the winter by hiding in cracks and crevices of buildings, etc., in the adult stage, but they may hibernate in the pupa stage—the one just preceding the adult stage. In the earlier stages of development they can survive in manure heaps, etc. The second way flies can pass the winter is by continuous breeding—thus they gather in a building which offers both food and breeding places and survive through several generations.

Flies Multiply Rapidly.

Flies multiply very rapidly, a generation requiring but 11 to 14 days in summer for complete development and to again reproduce. When you consider that the female lays approximately 120 eggs at one time and lays at least two and possibly four such batches, which in turn will be ready to reproduce in about two weeks, the enormous numbers in which the insects occur are plainly accounted for.

The ideal breeding place for the fly is the manure pile, which offers warmth, moisture and food. It will lay its eggs on a great variety of decaying vegetable and animal materials, but prefers the first place mentioned. In the absence of manure, it breeds in slops or fermenting vegetable matter, such as hops, moist bran, ensilage and rotting potatoes. The eggs are deposited below the surface in the cracks, several females usually depositing in one spot. The eggs hatch in 24 hours under ideal conditions.

Now that we have discussed some

of the habits of the fly, we are ready to apply this knowledge in getting rid of the pests, through prevention and control measures.

A careful screening of windows and doors during the summer months, with the supplementary use of sticky fly papers, is a protective measure against house flies known to everyone. It is only necessary to emphasize the importance of keeping food supplies screened or otherwise covered so that flies can gain no access to them. Screening does not lessen the number of flies, but it does prevent food contamination.

Fly poison preparations are common. Many of the commercial fly poisons contain arsenic, and their use in the household is attended with considerable danger, especially to children. A weak solution of formalin will be less dangerous—use three teaspoonsfuls of commercial formalin to a pint of milk or water sweetened with a little brown sugar. A sodium salicylate solution has been found almost equally effective, using three teaspoonsfuls of the powdered chemical to a pint of sweetened water. The best way to expose these poisons is to fill a glass with the liquid, place a saucer or plate lined with blotting paper bottom up over the glass, and invert the glass. Then place a match stick under the glass, and you have a good poison fountain. The sugar attracts the flies.

Fly traps of screen can also be made, but they are some trouble to make, and other methods have been found even more effective.

New Poison Concocted.

There is a new commercial poison on the market—a liquid which can be blown into the air or onto a window pane—which kills any insect that comes in contact with it. It does not harm woodwork or wall paper. One bottle will last all summer. The chief disadvantage is the temporary disagreeable odor.

The best way to fight flies, however, is to prevent their multiplying by the elimination of their breeding places. Disposal of manure will be found the greatest problem on the farm. Many methods have been tried and some found entirely successful. It is suggested first that the stables be so constructed as to be easily and completely cleaned to prevent flies laying their eggs in the corners, etc. It is pointed out that the manure should be removed every three days, or at least twice a week, during the summer months. This is done because the fly larvae will leave the manure in two or three days as they approach the second stage of their growth, and stay in the moist soil underneath for some time.

But on the farm it is impossible to remove the manure from the premises twice a week. It may be stored in fly-tight pits or bins so constructed as to be easily filled and easily cleaned.

The lid must be kept closed except when the stables are being cleaned. The disadvantage here is that the manure is often contaminated before removal from the stable, and the flies can then develop and escape. If the farmer had time, the manure could be removed every morning and spread thinly over the land to be fertilized so that it would dry quickly. In this way the fertilizer would have its maximum strength.

Chemicals Found Effective.

But the usual way is to remove the manure and leave it in heaps near the

stable. How can fly breeding be prevented under these conditions? In two ways. The first is to treat the manure with chemicals which will destroy the fly eggs. Two such chemicals have been found which are effective in killing maggots, are inexpensive and do not destroy the fertilizing quality of the manure—hellebore and powdered borax.

The hellebore is most effective as a solution sprinkled over the manure heap at the rate of 10 gallons to 10 cubic feet of manure. Make the solution by adding one-half pound of hellebore to 10 gallons of water, stir and let stand for 24 hours before using. The only objection to the use of hellebore is the possibility of poisoning farm animals should they have access to the solution in the barrel or tank where it is stored. Chickens were not injured from pecking in the treated manure, however.

Powdered borax is not poisonous and is easily transported and handled. It also gives best results in solution, a minimum of 0.62 pound per eight bushels of manure, or about one pound to 16 cubic feet being necessary. Borax not only kills the larvae but prevents the eggs from hatching as well. Large amounts of borax have been found injurious to plants fertilized with treated manure, but when the borax was used in the amount given no harmful effects were noted.

Maggot Trap Built.

The second method is the maggot trap wherein the manure is thrown

on a platform of closely placed slats built over a water-tight cement base which is flooded with water. The larvae start to crawl out of the manure, drop into the water and are drowned. The cement floor should be lower at one corner, so that it may be drained and cleaned occasionally. A platform 10 by 20 feet has been found quite satisfactory.

All these preventative methods just given apply to the farmer rather than to the housewife, but it will usually devolve on the housewife to furnish the incentive to act to her husband. They are given that she may have real constructive measures to meet the problem. The woman can, with care, keep her house free of flies, but the farmer can keep the number down to a small minimum. If all the farmers in the community can be aroused to the necessity for co-operation in the matter, then, and then only, can the fly menace be done away with. It is up to the housewife, who realizes the danger, to bring the matter before her neighbor housewives, so that all may do their part and get their respective "hobbies" to do likewise. This is early in the year, but that's just the time to begin the campaign, before the fly does!

Rags for Bandages.

KEEP all scraps of white linen or other soft white material and when washed put in a sterilized fruit jar. Keep the lid on and you will always have clean bandages for cuts and bruises.

Apple Desserts

AGAIN we come back to apple desserts—we had them the very first time this department appeared—and now again. But there are so many delicious things to be made of apples that we could have them many times and not exhaust the list. Most apple desserts are simple and easily made and that's an advantage to the farm housewife. Then, too, all of them are made from things usually kept on hand. No need for a shopping trip before making an apple dessert.

Cinnamon Apple.

Select nice large apples, wash and cut in halves. Pare. To each apple of medium size—

3 T. sugar. 3 c. boiling water.
2 T. flour. 1/4 t. cinnamon.
1 T. butter. Speck of salt.

Mix sugar, salt, flour and cinnamon and sprinkle the apple, which is placed in a pan skin down. Dot with butter and over all pour the boiling water. Bake.

Scalloped Apples.

2 c. good cooking apples. 2 T. lemon juice.
apples. 1 c. bread crumbs.
6 T. sugar. 1/2 T. fat.
1/4 t. each nutmeg 4 T. water.
and cinnamon.

Melt the fat, add the crumbs. Oil a baking dish. Cover the bottom with crumbs. Have the apples pared and sliced into thin pieces. Arrange the apples on the crumbs and sprinkle with sugar, spices, lemon juice and water. Cover with the rest of the crumbs and bake until the apples are done, about 15 minutes.

Apple Rolls.

Mix 2 c. of flour, 4 t. baking powder and 1/2 t. salt, using a fork for the mixing. Add 1/4 c. water and roll in oblong shape on a board. Spread with 4 apples sliced thin and dust with 1/4 c. sugar and some cinnamon. Roll as for jelly roll and bake.

Apple Fluff.

3/4 c. apple pulp (cooked, dried or fresh and run through a sieve).
3/4 c. cream.
1/2 c. cooked raisins.
1/2 c. chopped nuts.
1 T. gelatin (soaked in 1/4 c. cold water and melted).
1 egg white, well beaten.

Mix gelatin, cream, pulp and allow to partly set. Whip with wire whip, and whip in well beaten egg. Add the nuts and raisins last.

Peerless Baked Apple.

1 apple. 1 t. butter.
1 t. jelly. 4 T. water.
2 T. sugar.

Wash and pare apples. Remove core, being careful not to cut through blossom end. Place in baking dish. Fill cavity in apple with jelly, sugar and butter. Add water in dish. Bake in hot oven, basting frequently with liquid in the dish.

Dried Apple Cake.

1 c. dried apples 1 egg.
cooked until 3 1/2 c. flour.
plump. 1 t. soda.
1 c. molasses. 1 c. sugar.
1/2 c. butter. 1 t. cloves.
1 c. buttermilk. 1 t. nutmeg.
1 t. cinnamon.

Cook molasses and apples till thick. Cool. Mix the cake batter as usual for butter cake and add apple mixture. Bake 30 minutes in moderate oven.

Apple or Prune Souffle.

3 T. flour. 3 eggs with yolks.
2 T. fat or oil. and whites beaten separately.
1/2 t. salt. 1/4 c. water.
3/4 c. hot apple pulp. 3 T. sugar.

(To prepare the pulp—Steam 3 or 4 large apples until soft, mash through a strainer.)

Melt the fat, add the flour, water, salt, apple pulp and sugar, and make as in white sauce. Cook 10 minutes.

Cool to lukewarm and fold in the well beaten egg yolks. Lastly blend in the whites. Turn into a buttered baking dish and set in a pan of hot water to bake. Bake until firm throughout, and a silver knife has a clean surface when plunged into the souffle. Serve with a lemon or custard sauce.

Apple Sherbet.

1 1/2 c. orange juice. 2 t. gelatin.
2 1/2 T. lemon juice. 2 c. water.
2 c. apple pulp. 1 t. vanilla.

Make syrup of water and sugar. Soak gelatin in cold water and dissolve in syrup. Mix all the ingredients and freeze in usual way.

Baked Apples.

Wash and core apples and place in a baking pan. Fill cavity with sugar and add a small amount of nutmeg and butter. Put a little water in the bottom of the pan and bake until apples are soft. More water and sugar may be added and the syrup thickened with cornstarch. This may be poured over the baked apples when served.

Baked Apples With Fruit Dressing.

Bake apples in usual way. Make syrup of 1 c. water, 1/2 c. honey and juice of 1 lemon and 1 t. grated rind. Add 4 T. chopped raisins, 4 chopped nuts and 4 chopped dates.

Simmer for one-half hour on back of stove. When the apples are done put in glass dishes and fill cavity with the fruit and pour the syrup over.

Southern Apple Pone.

1 apple. 1/4 t. salt.
1/2 c. milk. 1/2 T. molasses.
8 T. cornmeal. 2 T. suet.

Pare and core the apple. Place in a baking dish. Scald milk and add the cornmeal, cooking it several minutes. Add salt, molasses and finely chopped suet. Pour over the apple and bake slowly one hour.

Apple Fritters.

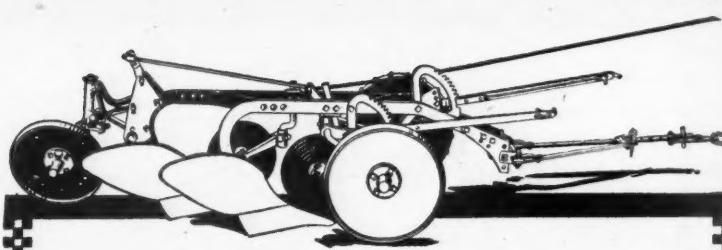
4 large tart apples. 1/4 t. salt.
1/2 c. flour. 1/2 c. milk.
2 t. baking powder. 1 egg.

Mix and sift the flour, salt and baking powder, add the milk gradually and the egg well beaten. Then add the apples, pared, cored and cut up quite fine. Drop from a teaspoon into deep fat and fry until golden brown. Drain and serve hot with or without syrup. The fat is the right temperature for fritters when a cube of bread dropped in the fat will brown in one minute.

c = cup.

t = teaspoonful.

All measures are level.



And Now His Orchard is Healthy Again—

For several years the twelve-acre apple orchard of F. R. Davis, "Sun-Kissed Fruit Farm," Casnovia, Mich., had been in sod.

The Trees Looked Yellow

"I felt that I had set my orchard back at least three years by not working the ground," says Mr. Davis. "Any orchard must be fed, and the most natural way to do this is to plow under the feed (cover crops) and work it into the soil."

He Bought a "45-A"

Mr. Davis bought the John Deere No. 45-A, the low, narrow orchard plow for use with small tractors. He plowed his orchard thoroughly, under the low limbs up close to the row. And now his trees are healthy again.

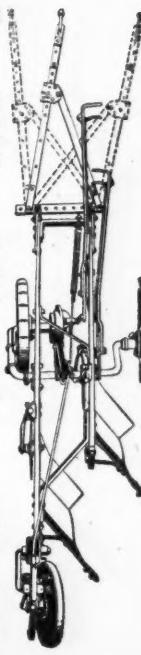
He's Satisfied

"The No. 45-A will not tip over on the turns," says Mr. Davis. "It pulls easy, does a clean piece of work, and is surely satisfactory with us."

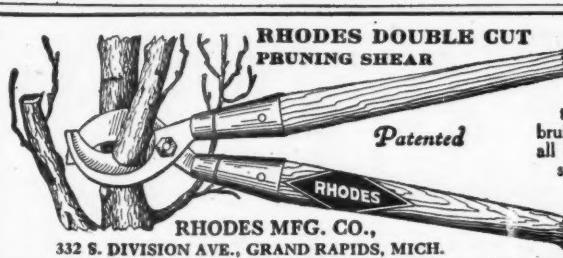
Every Orchard Needs a John Deere No. 45-A

Turn under cover crops. Feed the soil. Plow deep or shallow. The "45-A" is only 26 inches high, when plowing six inches deep; only 37 inches wide; no projections—gets under low limbs up close to row. Hitch adjustment permits setting plow out to right or left of tractor for plowing close, throwing either to or from the row.

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40% Nicotine

kills
Aphids



Importance of the Male in Poultry Breeding Flock

by H. A. Bittenbender

IT WAS only a few years ago that very little attention was ever given to the chickens on the average farm. There were very few poultry breeding establishments where pedigree males could be secured. Today we find that some thought is being given to the majority of the poultry flocks. Without doubt, more attention has been paid to the selection of the females. The male, however, is one-half of the flock and should be given the same careful consideration as the females.

Breeding

It is the ambition of every poultryman to have a flock of hens that will average 200 eggs or more per bird. In order to achieve this enormous average, it is necessary to most carefully select and to breed from the very best individuals in the flock. The birds must be housed in the very best type of house, and the up-to-date principles of feeding must be used in order to get maximum results.

The average production per hen is further below 100 eggs than it is above. Considerable improvement can be made by the proper selection of males. Where possible, it is best to purchase pedigree male birds where the ancestry is known. However, it is impossible for everyone to purchase male birds from trapnested hens. The writer hopes to point out a few basic principles of selection which have proved to be beneficial.

Selection of Males.

Constitutional vigor coupled with masculinity and maturity forms the real basis for selection.

Physical Strength.

Head—Short, broad and deep.
Beak—Short, stout, broad and well curved.
Eyes—Bright, alert and prominent.
Comb—Red in color, well developed in size.
Body—Broad, uniform in width, especially across the back.
Breast—Full and well developed.
Legs—Stout, placed directly beneath the bird, knee or hock joints wide apart.
Toes—Straight and toe nails well worn.

Physical Weakness.

Head—Long, narrow and lacking depth from top to base of beak; nostrils small and elongated.
Beak—Long, straight and pointed.
Eyes—Dull and sunken.
Comb—Undeveloped and often pale.
Body—Narrow, especially through back; lacking in depth.
Breast—Undeveloped and sharp.
Legs—Long and stilt-like or bending at hocks, giving the bird a squatting appearance.
Toes—Long. Toe nails sharp.

Masculinity can best be determined by the activity and general appearance of the bird. If strong and masculine, he will be fearless, not necessarily pugnacious, but he will be willing to take his part in any scraps.

Coupled with masculinity comes maturity. The bird will develop in all sections, showing full plumage, and he will nearly always present a good appearance, while the bird lacking in maturity will usually be slow in development and awkward in appearance. Perhaps the head is the best indicator of the masculine development of the male bird. Those birds that have the greatest masculine development will have comb and wattles well developed in size and fiery red in color, while bird lacking in masculinity will show less color in the head and slower development of comb and wattles.

The bird of lesser masculinity is more apt to be a coward, whipped and driven to the corners. However, the cowardly attitude of a male bird should not be used as a sole means of discarding a male. Oftentimes I have seen male birds that were strong and vigorous and of good type and conformation through some cause or other become whipped and trampled. Perhaps several birds at one time happened to pick on this particular bird and simply broke him down until he was afraid. Yet when he was sepa-

rated from the rest of the males he proved to be an exceptionally good bird. All factors should be taken into consideration when a selection is made.

Males showing physical weaknesses, particularly those of conformation, should be put on the market. A male that grows too slowly very rarely is capable of transmitting high egg production. Reasonable early maturity in males is to be desired the same as in females. We want to get our broilers on the market early, and we want to get our pullets to come into laying before cold weather. Therefore, it is essential that the males should carry reasonably early maturity. Size, however, should not be sacrificed for early maturity. Quality must be kept in mind at all times. A male with heavy coarse shanks and a coarse meaty head is not to be desired.

Particular attention should be paid to the standard type of the breed and the color of the variety. While feathers do not necessarily mean eggs, it is necessary to follow a certain standard of selection. Wherever possible, it is best to follow as closely as possible, the requirements laid down by the American Poultry Ass'n in the Standard of Perfection. In no case is it advisable to use disqualified birds. Some of the general disqualifications found in the American Standard of Perfection that should be kept in mind are: Stubs or down on shanks, feet, or toes of breeds with unfeathered shanks, or indications that they have been removed; more or less than the required number of toes; deformed beaks; decidedly wry tails; crooked backs; lopped combs, except in Mediterranean, Continental and Corking females; combs foreign to the breed; split combs; side sprigs or sprigs on all single-combed varieties; decidedly squirrel tail.

It is advisable for everyone breeding standard bred chickens to have a copy of the American Standard of Perfection to properly make selections for standard type and color. It should always be kept in mind that first of all the male bird should possess vitality, constitutional vigor and masculinity.

Notes on Spray Machinery

(Continued from page 43.)

THE AIR CHAMBER.

All properly equipped spray outfits now carry an air chamber and the function of this part is to equalize the pressure and the flow of liquid to the nozzle. These chambers are usually made of heavy cast steel and should be of good size and tested to withstand the high pressures now in use.

AGITATORS.

An outfit which does not have a good agitator would certainly be most unsatisfactory to the grower. Agitation may be secured in power sprayers by the propeller type, which is located near the bottom of the tank. Two or three wings or blades are provided for each propeller, and one propeller may be found at each end of the tank. Some outfits are geared to run the agitator at 100 revolutions a minute, but the speed should depend on the size and the arrangement of the blades. One or two makes of outfits are equipped with a paddle type of agitator. Two wooden strips are attached to an extension from the steel agitator shaft. These strips are nearly as long as the tank and revolve slowly with the shaft, churning the material thoroughly and passing within an inch of the bottom of the tank. This type is very efficient, and may be found on two makes of sprayers.

In general, the requirements for a

(Concluded on page 53.)

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Timeliness in Apple Scab Control

(Continued from page 44.)

spring rains, discharge the spores into the air to be caught up by the wind and blown about (Fig. 3 E, F). This ripening of the spores of the winter stage, in general, keeps pace with the onset of spring and is "timed" to occur just as the blossoms push out of the swollen buds.

The spores shot by the sacks into the air and caught by the air currents are carried here and there and some reach the strap-like first leaves and some reach the blossoms themselves. Here they sprout in films of water and bore into the apple tissue. After about a week—the time varies with the temperature—the fungus goes to seed—produces a crop of spores (Fig. 3 A). These spores are produced in abundance, literally thousands developing from a single infected area. These spores are shed and again blow about the trees. The spores sprout (Fig. 3 C) when the leaves are wet and bore into the leaf or fruit. Once inside, the fungus produces a typical scab spot, perhaps an eighth of an inch in diameter. In a week after infection, the fungus goes to seed again and produces its thousands of spores. These again blow about the trees, reinfect and produce their seed. The time from spore to spore is only a week, and increasing as the scab does a thousand fold at each generation, it is evident that in a month the fungus can so entrench itself that every leaf and fruit is scabbed.

Note that the fungus starts small but such are its powers of reproduction that it can augment itself a thousand fold. Note also the sharp dependence of the scab upon the weather for its development. The winter spores are only discharged when the leaves are wet, and infection takes place only when there is a film of water on the leaves or developing fruit in which the spores (seeds) can sprout. Think back over last season and the reason for the freedom from scab can readily be explained—last season started with an unprecedented drought at the time when the apples were blossoming and which continued for some weeks after. The dry weather prevented apple scab getting its usual early and destructive start.

Control of Scab by Spraying.

Now we must apply these facts to the matter of control by spraying. We are fighting a parasite which starts in the spring from fallen leaves. The less scab there is on the leaves—the cleaner the ground under the trees—the less scab there will be. Scab is chiefly to be prevented, however, by putting on a protective coat of spray which will kill the scab organism before it gets itself buried out of reach in the apple tissue.

Control of scab hinges upon finding the vulnerable points for attack, for we must recognize that the spray application can ward off scab, not cure it after infection has taken place. It is evident therefore, that the critical thing in apple scab control is to spray at the right time. The right time is just before the discharge of the winter spores. How can the fruit man determine this? For the last few years fallen leaves have been obtained weekly from apple growing centers and these have been examined microscopically at the Michigan Agricultural College Experiment Station. For each state similar service is rendered by the various state experiment stations. When spores are found to be mature, press notices advising prompt application of sprays are sent out in order to have the protective coat on before the next rainy period. In Michigan the notice is sent to each county agent as the critical date is determined or approximated for his locality and he is in position to relay the information which the fungus itself gives about spraying.

Delayed Dormant or Pre-pink Spray Advised.

In these studies we have noticed
(Concluded on page 58.)

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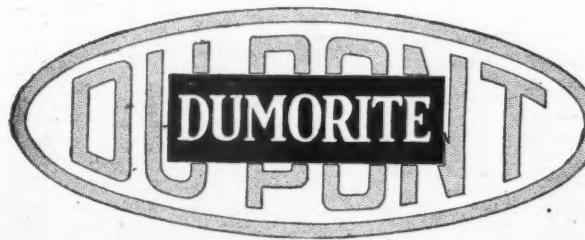
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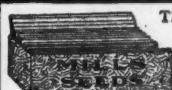
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Cut in one size and requires 2 1/2 yards 27-inch material with 9 yards edging.

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44, 46, 48 and 50 inches bust measure. Size 36 requires 3 1/4 yards 40-inch material with 7/8 yard 36-inch contrasting.

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No. 1949. Pretty Blouse Style.

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Phoma Fruit Spot of Apples

(Continued from page 28.)

develop later into typical Phoma fruit spots. This development of spots under cellar storage and delayed storage conditions might give the impression that the disease spreads in storage, but this is not the case. The new spots that appear in storage are the results of orchard infection and not of a spread of the disease from one apple to another.

Control.

Phoma fruit spot is not difficult to control, yet it often causes considerable loss in orchards that have received relatively good care. The real difficulty lies in the fact that the disease is so susceptible to weather conditions and so erratic in its occurrence that control measures are often neglected. If the disease has not been serious for a few years, the losses from it are somewhat forgotten, and if June and July are showery, the orchard program is likely to become too crowded to include any work of questionable value. The result follows that midsummer sprayings are omitted in the very year that they are most needed.

The Phoma fruit spot has a long incubation period and it is somewhat difficult to determine when infection actually occurs. Apparently the apples are never infected before the middle of June and probably seldom, if ever, before the first of July, and the infection period may continue into August.

In dry seasons the calyx spray and the application three or four weeks later may be of some value in holding Phoma fruit spot in check, but they should never be relied upon for complete control. Where the disease is of sufficient importance to receive special consideration, a thorough spray application should be made eight or nine weeks after the calyx spray. This one application is usually sufficient to secure practically complete control, but if the weather is showery it may be advisable to follow it with another a few weeks later. Orchards that are sprayed for blotch and bitter rot do not require other treatment for Phoma fruit spot.

Bordeaux mixture gives excellent control of the disease and lime-sulphur combined with arsenate of lead gives practically as good results. Lime-sulphur alone sometimes fails to hold the disease in check. Very satisfactory results have been obtained with double strength arsenate of lead without the addition of sulphur or copper or other fungicidal material. The spreading and sticking qualities of the spray material are important factors in the control of the disease.

In spraying for Phoma fruit spot, it should be borne in mind that the blossom half of the apple is especially susceptible to the disease. Sprays that are directed downward on the tree from a tower are not likely to give the blossom areas a good covering, and if the foliage is heavy, entire apples may escape treatment. Sprays that are directed upward from the ground are much more effective. Very thorough results can be obtained by using an angle nozzle, extending the nozzle into the center of the tree to throw the spray upward and outward and making sure that all fruit surfaces are covered.

Notes on Spray Machinery

(Continued from page 50.)

good spraying machine are that it should be as light as possible so as to be conveniently handled under trying working conditions, as on hilly or soft ground. It should be constructed with a minimum number of parts requiring attention, and so placed that they may be easily repaired or replaced when necessary. The outfit must be built strongly enough to withstand the ordinary emergencies in the field. Strength and durability should not be sacrificed for the sake of lightness, but when the three are consistently combined, a very important phase of manufacture has been accomplished.

The Farmer's Interest In Good Railroad Service

FARMERS must have good and adequate railroad service. When they cannot get enough freight cars they suffer heavy losses.

The railways are making tremendous efforts and large investments to improve their properties and increase locomotives and cars to enable farmers and other producers to ship all their products, and ship them promptly.

For some years there were repeatedly "car shortages" which made it impossible for many thousands of farmers to ship their wheat, corn, livestock and fruit when they wanted to. These conditions existed because, chiefly owing to unwise and restrictive regulation, the development of the railways had greatly declined.

How Railroad Development Declined

From 1907 to 1914 the railways bought an average of more than 130,000 freight cars each year. Freight cars, like farm wagons and other vehicles, wear out. In these years the railways "scrapped" an average of 80,000 cars a year. The average increase in the number of cars in service was 50,000 a year.

Then restrictive regulation and other causes greatly slowed down railway development. From 1914 to 1921 the average number of new freight cars bought was only 79,000 a year; the average number retired, 74,000 a year. Therefore, in these years the average increase in the number of freight cars was only 5,000 a year.

Do you wonder that when the increase in freight cars declined from 50,000 to 5,000 a year there were "car shortages"?

From 1907 to 1914 the railways bought 3,100 new locomotives a year, and "scrapped" 1,600 a year. The increase in locomotives was 1,500 a year. From 1914 to 1921 they were able to buy an average of only 1,700 locomotives a year, and had to retire 1,450. Therefore, the average increase in locomotives was only 250 a year. This was only one-sixth as great as the yearly increase up to 1914.

The production and commerce of the country were continuing to grow as before. The railways could not meet the demands made upon them because they were not able to increase their freight carrying capacity as before.

The framers of the Transportation Act of 1920 saw this decline in railway development must stop. Otherwise farmers, manufacturers, mine operators would become unable to ship their products. A paralysis of business and a great national disaster would result.

Therefore, Congress provided in the Transportation Act that the Interstate Commerce Commission in regulating rates and the "fair return" the railways should be allowed to earn must

This is one of a series of advertisements published to give the farmer authentic information about railroad matters. Any questions that you would like to ask will be cheerfully answered. Address:

WESTERN RAILWAYS' COMMITTEE ON PUBLIC RELATIONS

650 Transportation Building, Chicago, Illinois

S. M. FELTON, President,
Chicago Great Western Railway.

L. W. BALDWIN, President,
Missouri Pacific Railroad Co.

RALPH BUDD, President,
Great Northern Railway.

H. E. BYRAM, President,
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HALE HOLDEN, President,
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C. H. MARKHAM, President,
Illinois Central Railway.

C. E. SCHAFF, President,
Missouri-Kansas-Texas Lines.

Apple Blotch Control

by Max W. Gardner

Purdue Agricultural Experiment Station

ENORMOUS and unnecessary losses are suffered by apple growers in the southern part of the apple belt because of the ravages of the fungous disease known as blotch. Investigations of this disease recently carried out at the Purdue University Agricultural Experiment Station (Bul. 267) have shown that the blotch losses may be effectively prevented by certain additions to the ordinary spraying program and by certain precautionary measures not hitherto practiced.

A more intimate understanding of this disease on the part of orchardists will materially assist them in controlling blotch. In the first place, it should be remembered that blotch is much more limited in its varietal preferences than are certain other diseases, such as scab and black rot. This knowledge is particularly important to those who are about to set out a new orchard anywhere south of a line running more or less through the centers of Nebraska, Iowa, Illinois, Indiana, Ohio and Pennsylvania, because, other things being equal, extremely susceptible varieties should not be chosen.

Susceptible Varieties.

The extremely susceptible varieties are Northwestern, Oldenburg (Duchess), Missouri, Smith Cider, Mann, Maiden Blush, Benoni, Akin, Lawyer, Willow, Arkansas Black, Rome, Stark, Limbertwig, Lansingburg, Gano and Transparent. On the other hand, a high degree of resistance is shown by such popular commercial varieties as Delicious, Winesap, York, Stayman, Jonathan and Grimes.

Since the blotch fungus persists from year to year in cankers on the twigs and branches, varieties which canker badly act as carriers and harbores of infection. Blotch cankers

have been found very commonly on nursery stock of a number of varieties among those listed above as susceptible and on others as well. This brings us to a most important phase of blotch control. Much evidence has been obtained which indicates that blotch is introduced into young orchards with cankered nursery stock and it behooves orchardists to inspect carefully all of their nursery stock for the blotch cankers on the trunks or limbs and to reject infected shipments.

Cankers on Seedlings.

Furthermore, the cankers have been found abundantly on the seedlings used as stocks and nurserymen should guard against the introduction of the disease into their nurseries with such seedlings which are often purchased in large quantities. Unlike scab, blotch is primarily a water-spread disease and conditions in the closely planted nursery row are ideal for wholesale infection by this fungus. The spores ooze out of the spore-cases in the cankers during wet weather, are washed to the soil, carried by surface drainage water and splashed onto hundreds of trees, there to germinate and produce more cankers. Nurserymen should guard also against the blotch menace by taking buds only from blotch-free trees and by avoiding the use of susceptible stocks, such as Northwestern. Above all, nurserymen in the blotch belt should apply the sprays to be described later.

How Disease Is Spread.

So far we have dealt only with principles of prevention applicable to future plantings. Let us next take up the case of the owners of young plantings in the blotch region. What may be done here to guard against the

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Do Better Pruning in Less Time

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the value of thorough cultivation with the

Clark CUTAWAY

California Orchard Plow

Our complete catalog describes this and other CLARK "CUTAWAY" orchard tillage implements; also the Bush and Bog Plow for subduing rough land and preparing it for orchard use. Our book,



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One man with the Boyce Double Gun does the work of two men with single guns. The two nozzles give double the volume and double the width of coverage, while retaining the extreme fineness of spray fog produced by the small-diameter opening. The operator thoroughly sprays a tree with half the motion and in half the time required with a single gun.

The Boyce combines high-class work with high speed and utmost economy. As simple and easy to adjust as any single gun, and does its work perfectly at either long or short range.

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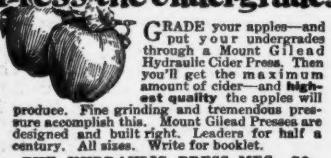
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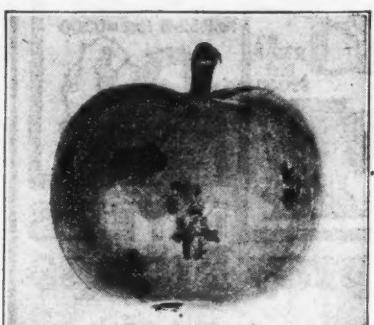
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future blotch menace? Here again another peculiarity of the fungus should be understood. There seems to be no extensive wind spread of blotch such as occurs in the case of apple scab. Blotch spreads mainly by the dripping or splashing of rain and dew and by wind-blown rain. Therefore where orchards are well separated, there seems to be very little spread from one orchard to another. Each orchard presents a distinct and separate case as far as blotch is concerned.

Furthermore, in young orchards where the small trees are as yet wide-



Blotch on young fruit.

ly separated, there seems to be very little spread of blotch from one tree to another. In many young orchards of susceptible varieties only a certain and often small percentage of the trees contain cankers and the indications are that these were originally infected in the nursery. Furthermore, even in old orchards individual trees of the same variety vary greatly in the severity of the disease and exhibit these individual differences year after year. Therefore one is led to the conception that the severity of the disease in an orchard depends upon the number of infected trees originally planted and the subsequent rate of formation of new cankers higher and higher in these originally infected trees year after year, accompanied by a gradual infection of the other trees.

Start the Fight Early.

If, then, in every young orchard containing susceptible varieties, blotch



Blotch spots frequently cause the fruit to crack open.

cankers are apt to be present on a certain percentage of the trees and increasing in number year after year, should not an active fight against the disease be started as soon as possible? Growers in the Vincennes region of Indiana have answered in the affirmative. Here there are extensive plantings of young Oldenburg, Transparent, Maiden Blush, Rome and other susceptible varieties, and an active campaign is being waged against the disease by applying the blotch sprays every year to prevent new cankers and by cutting all of the old cankers out of the trees now infected. The spraying will be discussed later.

In orchards set out not over five or six years, it has proved feasible to eradicate the blotch cankers by pruning out infected twigs and spurs and by shaving the cankers from the trunk and larger limbs with a sharp pocket knife. The cankers are shallow and can be removed without injury to the underlying cambium layer. All of the discolored bark should be removed



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Send for free illustrated booklet on leaf-eating insects.

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It's *and will be mailed to any one interested in Spraying* Free

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MYERS COG GEAR BARREL SPRAY PUMPS FIG. 1521
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MYERS BRASS BUCKET SPRAY PUMPS FIG. 1726
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THE F.E. MYERS & BRO. CO. No. 150 Orange St.
ASHLAND - OHIO.

and the cut should extend half an inch or more beyond the visible margin of the canker, particularly at the sides since the cankers tend to encircle the limb. The fungus penetrates considerably beyond the visible margin and has been found alive in this tissue in cankers over five years old.

Do Surgical Work in Early Spring.

This surgical work should be done in the early spring before the leaves appear because the cankers are more easily detected at that time and because the wounds heal rapidly and become mere surface scars in the bark. No disinfectant or wound dressing has been found necessary. The main difficulty is in detecting all of the cankers and careful inspections during at least the two following springs are absolutely essential in order to detect and remove cankers that were overlooked or invisible at the time of the first operation.



Blotch cankers on nursery stock.



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GRASSELLI has been manufacturing chemicals since 1839. The name, known to every chemical-using industry, is your greatest assurance of quality. In getting results from spraying, so much depends upon the reliability of the spray that it will surely pay you to look for the name Grasselli before you buy!

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ALL MONEY MAKING SORTS • 65 VARIETIES.

The Simpson Orchard Co., at Vincennes, have cut the cankers out of more than a thousand young trees in their orchards at a cost of about five to ten cents per tree, and by means of the sprays, have successfully prevented the formation of new cankers so that the disease seems to be almost eradicated from their plantings.

The special blotch sprays, previously alluded to, are absolutely essential in blotch control. It was found by Scott and Rorer early in the study of this disease that it could be successfully controlled by summer sprays of Bordeaux mixture and the principal subsequent changes have consisted in an earlier application of these sprays and the use of weaker strengths of Bordeaux. Results obtained in recent years indicate that the disease is almost perfectly controlled by spray applications at petal-fall and two, four and six weeks thereafter, because the spread of infection seems to be confined to that particular period. There has been, and still is, considerable difference of opinion as to the kind and strength of spray material to use. Results obtained in Indiana indicate that lime sulphur is not as reliable as Bordeaux and that the weaker strengths of the latter, such as 2-4-50, are completely effective against the disease. For the petal-fall spray, the ordinary lime sulphur scab spray may be used, especially on varieties such as Ben Davis, which are subject to Bordeaux injury, because in most seasons the two weeks' spray is early enough to precede the first blotch infection. Because of the Bordeaux russet on Ben Davis, many growers may prefer to use lime sulphur, but the weaker Bor-

(Concluded on page 58.)

for F

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FOR SALE—APPLE ORCHARD OF 103 ACRES in the orchard section of Johnson County, situated 3½ miles from station, five churches and school, ½ mile from concrete road leading to the best market of the country. Gross sales 1923 were \$10,000. Will divide into 40 and 63 acre lots and sell separately. J. C. B. Heaton & Son, New Burnside, Ill.

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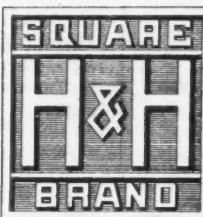
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Apple Blotch Control

(Continued from page 56.)

deaux mixtures have given more satisfactory results in Indiana.

Origin of Twig Cankers.

One of the recent discoveries was that most of the twig cankers originate from infected leaf stems and that the sprays which prevent fruit infection also effectively prevented leaf infection and consequently canker formation. Therefore there is a potent reason for spraying every year regardless of crop to prevent canker formation, since the failure to spray one season will result in a new crop of cankers to spread infection the next year. Of course it is unnecessary to emphasize that this spraying must be careful, thorough and timely. Furthermore, the sprays should be applied every year in young orchards and nurseries in the blotch region, as has been mentioned above, in order to prevent canker formation. These sprays may be accurately timed by observing the blossoming time of bearing trees in the same general region.

Important Supplementary Measures.

In old orchards the problem of blotch control is primarily one of spraying, but there are important supplementary measures. In the first place, it is frequently the case that certain badly cankered trees of such varieties as Northwestern, Smith Cider, Oldenburg, or Mann are serving as sources of annual fruit infection for a number of other varieties. Under such conditions fruit infection has been found on many of the less susceptible varieties, such as Grimes, Winesap and Stayman. Since it is expensive to apply the blotch sprays, and in fact not always desirable to spray Grimes, it may be cheaper in the long run to cut down and remove the blotch carriers, thus eliminating the source of infection. This is especially true in the case of old weakened trees. Furthermore, it is advisable to prune out suckers and water sprouts because these are especially subject to blotch canker. And a certain amount of pruning to open up the trees and thus facilitate thorough spraying is often desirable.

From the foregoing account, it may be seen that in addition to a knowledge of the spray control of fruit infection, orchardists should have a thorough understanding of the canker stage of the disease on nursery stock and in young orchards, and of the manner in which the disease gains a foothold and increases in prevalence in young orchards, so that by canker eradication and annual application of the right sprays they may greatly minimize the future blotch menace.

Timeliness in Apple Scab Control

(Continued from page 51.)

this significant thing: The apple scab fungus is maturing earlier than it was ordinarily supposed. The old spraying rule which has been followed for years and some years, we must grant, successfully, has advised a pink spray. But infection, especially with such early developing varieties as Duchess, has come so early in the last few years as to demonstrate that spraying, which begins at the pink stage and drags on and on, will not do the work consistently. The heavy scab infections of 1922, and which bid fair to be repeated at the next wet spring, result from getting the protection on too late.

For Michigan conditions—and nearby states do not vary greatly in this particular—we are advising strongly either a delayed dormant or a pre-pink spray, not to take the place of, but in addition to the regular pink spray. If these two spray applications are followed by another when the petals fall, the grower will have put on three coatings, in close succession and at the beginning of the season. These are applications when ordinarily the weather is wet—hence dangerous from the point of view of scab—and

when growth of leaves and fruit is most rapid.

Bunching of Sprays Important.

Let me point out that this bunching of the protective sprays in the early part of the season is exceedingly important. The purpose of the very first spring application is to prevent primary infections. The purpose of the second and third applications is to prevent the secondary and tertiary infections. This advice as to method of control is based on soundest biological principles. It recognizes that the scab fungus has enormous power of spreading. If once it becomes established, two or three generations, if unchecked, will spread scab throughout the entire orchard. By preventing as many of the first infections as possible, the secondary infections are few, and by preventing secondary infections largely, the development of the scab late in the season is not serious. And this process of heading off and preventing early infections is the only way that spraying can prevent apple scab. If apple scab is present everywhere on the leaves because you have neglected the primary and secondary infections—or gotten there too late—then such a rain of spores get to the developing apples that all the sprays that can be pumped on in August will not give blemish-free fruit.

During the 1924 season the Michigan station will again give warning to its growers. Other states will handle their local situations. With this information, growers can be sure of getting at their orchards in proper season. In general, each man must design his own spray practice. He knows his varieties, the lay of the land, the period of blooming and leaf development, the influence of sod, and the time it takes to cover the orchard. He must not go contrary to the principles outlined. He must spray when the spores are mature and before they are discharged. He must bunch his attack in the first half of the season. In general, large orchards are under-equipped to cover trees promptly and with despatch. A prepink spray is not a prepink spray if it drags into a pink or a petal spray. If the matter of timeliness means anything, it means the putting on of applications efficiently, thoroughly and promptly.

Spray Materials.

The fruit grower has a choice of spray materials, Bordeaux or lime sulphur, and there may be others. Either of the above mentioned do the work. Criticisms of these mixtures which exist in the minds of some growers and which are based on failures to control scab are rather to be laid to lack of timeliness in application rather than to the fungicides themselves. The evidence of the success of these two materials is so strong as to make their recommendation safe.

The fruit man in controlling scab is engaged in warding off the attack early in the season to secure clean conditions for fruit production. We must watch for the parasite developing on the leaves as a check on the success of his work. He must be on the alert to use to his advantage the timely warnings from his experiment station. But, chiefly, he must spray thoughtfully and purposely to keep clean from the very start the fruit and leaves on which the success of his crop depends.

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Those desiring extra copies of the Spray Number can secure them by sending in orders immediately at the following prices:

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Kind words from a smoker in far Australia

There is something besides
distance that lends enchant-
ment to this letter

A more modest manufacturer might not print this letter. He might file it away to bring out only on dull, gloomy days.

Nevertheless, when an enthusiastic pipe-smoker thousands of miles away takes his pen in hand to say something nice about Edgeworth, a breach of modesty on the manufacturer's part should be forgiven.

"Chetwynd," Copeland Road,
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Larus & Brother Co.,
Richmond, Virginia, U. S. A.

Gentlemen:

Perhaps you are somewhat surprised to receive this letter from Australia, often referred to in England, our Mother Country, as "Down Under."

I have noticed in some of your American magazines that I subscribe to, testimony in praise of your splendid tobacco. It has occurred to me that, as one of the many smokers of the Edgeworth in this Southern Continent of Australia, I can also add my testimony and appreciation of your world-wide-known and excellent tobacco.

It must be over twenty years since I first tried your Edgeworth Extra High Grade Plug Slice.

My tobacconist, one of the leading tobacconists of Sydney, had a trial consignment of the Edgeworth to test the taste of his customers.

Just at that time I was smoking several kinds of high-grade imported tobaccos, but somehow I could not get any of them that exactly pleased my taste. Some brands were excellent for a while, and then deteriorated.

But from the first purchase of your Edgeworth I have found it absolutely the one uniform standard, without any change during the whole twenty-odd years I have been smoking it. I have been so satisfied with it that I have never purchased any other make.

I have induced a great number of my friends and fellow officers to try Edgeworth, and most of them have the same high opinion of it that I have.

My wish is that your company may prosper and continue to manufacture the renowned Edgeworth, and that I and my fellow smokers of this "Fair Australia" may be spared to a good, ripe old age to enjoy your fragrant weed.

Yours sincerely,
(Signed) Thos. Skellett.

And all of this as a result of the one "trial consignment" of Edgeworth.

While it is too much to hope that everyone will have a satisfied smoking career after a few trial pipes of Edgeworth, you can never tell until you try the tobacco.

For free samples of Edgeworth—generous helpings of both Edgeworth Plug Slice and Ready-Rubbed—send a postcard with your name and address to Larus & Brother Company, 83 South 21st Street, Richmond, Va.

If you will also include the name and address of your regular "tobacconist," your courtesy will be appreciated.

To Retail Tobacco Merchants: If your jobber cannot supply you with Edgeworth, Larus & Brother Company will gladly send you prepaid by parcel post a one- or two-dozen carton of any size of Edgeworth Plug Slice or Ready-Rubbed for the same price you would pay the jobber.